SEQUENCE LISTING

<110> DSM N.V.

<120> Genes encoding enzymes in the biosynthetis of pimaricin and applications thereof

<130> S-2959

<140> 10/018,009
<141> 2000-06-14

<160> 14

<170> PatentIn Ver. 2.1

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acc gcg cat gga ggg ggt ggc ttc aca ctg cct gct gtg ttc gag gcc      96
Thr Ala His Gly Gly Gly Gly Phe Thr Leu Pro Ala Val Phe Glu Ala
                20                  25                  30


gcc gtg gaa tcc gcc ccc gac gca gtg gcc ctc gtc gac ggc acc gtt     144
Ala Val Glu Ser Ala Pro Asp Ala Val Ala Leu Val Asp Gly Thr Val
            35                  40                  45


cct gga cct ggg cgc atg tgg cgc gca gac gtc gat gcg ctg gcc cgc     192
Pro Gly Pro Gly Arg Met Trp Arg Ala Asp Val Asp Ala Leu Ala Arg
        50                  55                  60


ggg ttg cag gag tcg ggt atc gca ccc ggt gac gtg gtg gcg gtg cgg     240
Gly Leu Gln Glu Ser Gly Ile Ala Pro Gly Asp Val Val Ala Val Arg
65                  70                  75                  80


ctg ccg aac tgc ggg agg ttt ccc acc ctg cac ctg gcc gtc gcg gcc     288
Leu Pro Asn Cys Gly Arg Phe Pro Thr Leu His Leu Ala Val Ala Ala
                85                  90                  95


gtc gga gcg gta ctg ctg ccc atc cac cag ggc acc ccg ctc ccg gag     336
Val Gly Ala Val Leu Leu Pro Ile His Gln Gly Thr Pro Leu Pro Glu
                100                 105                 110


gtc gac gcg ctg ctg acc cgg gcg gaa ccc gcc ctt ctc gtc ctg tcg     384
Val Asp Ala Leu Leu Thr Arg Ala Glu Pro Ala Leu Leu Val Leu Ser
            115                 120                 125
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gcc gcc ggg agc gac ggc ctg gcg acg gcc cgt tcg ctt ctg gag agc   432
Ala Ala Gly Ser Asp Gly Leu Ala Thr Ala Arg Ser Leu Leu Glu Ser
    130             135             140

gtg ccg tcg ctg cgc ggc gtg ctg ctg gcc ggg gcg tcg gga gac ggg   480
Val Pro Ser Leu Arg Gly Val Leu Leu Ala Gly Ala Ser Gly Asp Gly
145             150             155             160

gag tcc gga tcc gtc gga ggt ggg gag tca gga tcc ggg cgt cgg tcg   528
Glu Ser Gly Ser Val Gly Gly Gly Glu Ser Gly Ser Gly Arg Arg Ser
                165             170             175

ctg gac ggg ctg ctg gcc ggc tgg gcg ggc agc ggg ccc cgg ccg gtg   576
Leu Asp Gly Leu Leu Ala Gly Trp Ala Gly Ser Gly Pro Arg Pro Val
            180             185             190

gac gtc acc ccc gat atg ccg ctc gtt ctc gtc ccc tcg tcc ggg acg   624
Asp Val Thr Pro Asp Met Pro Leu Val Leu Val Pro Ser Ser Gly Thr
            195             200             205

gtc tcg gca cgg ccc aaa ctg tgt gtg cac agc cac gac ggt ctg ctg   672
Val Ser Ala Arg Pro Lys Leu Cys Val His Ser His Asp Gly Leu Leu
    210             215             220

tcg aac acc gca gcc gtc acc gcc gag gcc gcc gac gcc ttc gac ggt   720
Ser Asn Thr Ala Ala Val Thr Ala Glu Ala Ala Asp Ala Phe Asp Gly
225             230             235             240

ccg gtc ctc acg gcc tgc ccg atg acc cat ctg ttc ggc ctc cag tcc   768
Pro Val Leu Thr Ala Cys Pro Met Thr His Leu Phe Gly Leu Gln Ser
            245             250             255

ctg cac gcg gcg ctg ttc gcc gcc tgc acg cag gtc ctg ctc acc ggc   816
Leu His Ala Ala Leu Phe Ala Ala Cys Thr Gln Val Leu Leu Thr Gly
            260             265             270

tgg gac gtg gac cgc ttc ctg gaa cag gct cgg gag cac ggc ccc cgt   864
Trp Asp Val Asp Arg Phe Leu Glu Gln Ala Arg Glu His Gly Pro Arg
            275             280             285

gtc gtg ttc gcc gtg ccc gcc caa ctg cgg gac gtc gtg aca cga ctg   912
Val Val Phe Ala Val Pro Ala Gln Leu Arg Asp Val Val Thr Arg Leu
    290             295             300

gcc agg acc ggc gaa ccg gcg ggc ttc acg ccg tac cag gtg cgt acc   960
Ala Arg Thr Gly Glu Pro Ala Gly Phe Thr Pro Tyr Gln Val Arg Thr
305             310             315             320

gcg ggg gcc gcc gtc gcg ccc gcg ctc gcc gta cgg gta cgc gcc gtc   1008
Ala Gly Ala Ala Val Ala Pro Ala Leu Ala Val Arg Val Arg Ala Val
            325             330             335

ctc gac tgc gaa ctg gtc gtg gtg tgg ggg atg tcc gag atc ggc acc   1056
Leu Asp Cys Glu Leu Val Val Val Trp Gly Met Ser Glu Ile Gly Thr
            340             345             350
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2

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ggc acc cgc acc cgg gcc cac cac ccc gac ggc tgt gtg gga gag ccg    1104
Gly Thr Arg Thr Arg Ala His His Pro Asp Gly Cys Val Gly Glu Pro
        355           360               365

gtc agc ggg gtg gac gtg cgc gtc gtc gac gag cac ggc caa gag tgc    1152
Val Ser Gly Val Asp Val Arg Val Val Asp Glu His Gly Gln Glu Cys
        370           375               380

gcg gcg gac gag agg ggt gaa ctc cag tac cgg ggg cca ggg ttg ttc    1200
Ala Ala Asp Glu Arg Gly Glu Leu Gln Tyr Arg Gly Pro Gly Leu Phe
385               390               395               400

cgc ggc tat ttc cgc gaa ccg gag ctg acg cgc tcg gcc ctc acc gac    1248
Arg Gly Tyr Phe Arg Glu Pro Glu Leu Thr Arg Ser Ala Leu Thr Asp
            405               410               415

gac ggc tgg ctg cgg acc ggc gat ctc gcg acc gtc gac gcg gac ggc    1296
Asp Gly Trp Leu Arg Thr Gly Asp Leu Ala Thr Val Asp Ala Asp Gly
        420               425               430

gtg gtg gtg ctg cac ggc cgg gcg gcc gag ctg atc aat acg ggg ggc    1344
Val Val Val Leu His Gly Arg Ala Ala Glu Leu Ile Asn Thr Gly Gly
        435               440               445

cgg aag ttc agc gcc ggc gag gtc gag gga ctg ctc tcc ggc ttt acg    1392
Arg Lys Phe Ser Ala Gly Glu Val Glu Gly Leu Leu Ser Gly Phe Thr
        450               455               460

gac ctg ggc ccg ctg gcc gtc gtc ggc gca ccg gac gac cgg ctc ggg    1440
Asp Leu Gly Pro Leu Ala Val Val Gly Ala Pro Asp Asp Arg Leu Gly
465               470               475               480

gag tac ccg tgc ctg gtc gtg acc gac cac gcg gac ggc acc atc ggc    1488
Glu Tyr Pro Cys Leu Val Val Thr Asp His Ala Asp Gly Thr Ile Gly
            485               490               495

ctg agc gag gtg acc gcg ttc ctg cgc cgg ctg ggg ctc gcc gac cac    1536
Leu Ser Glu Val Thr Ala Phe Leu Arg Arg Leu Gly Leu Ala Asp His
            500               505               510

aag atc ccc ctc gaa ctg gtc acc gtg cgc gag ctt ccc ttc tcc cct    1584
Lys Ile Pro Leu Glu Leu Val Thr Val Arg Glu Leu Pro Phe Ser Pro
        515               520               525

gcc ggg aag ctc gac cgc ggg gcg ctc aag cgg ctg ctc gcc aac ctt    1632
Ala Gly Lys Leu Asp Arg Gly Ala Leu Lys Arg Leu Leu Ala Asn Leu
        530               535               540

gcg gag gtg tcc gtt ccg gcc cgt ctc ggc gcg gtc ccg ccc tac acg    1680
Ala Glu Val Ser Val Pro Ala Arg Leu Gly Ala Val Pro Pro Tyr Thr
545               550               555               560

gcc gag gag gcg ctg gac ctc gta cgc gac tgc gtc ggc cgg gtg ctc    1728
Ala Glu Glu Ala Leu Asp Leu Val Arg Asp Cys Val Gly Arg Val Leu
            565               570               575

cgt tac ggc ggc gcg gcc gtc ccc ttc ccc ccg gac aag gac ttc ttc    1776
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3

Arg Tyr Gly Gly Ala Ala Val Pro Phe Pro Pro Asp Lys Asp Phe Phe
            580 .   585   590

tcc ccg gac aag gac ttc cgc cag ctc ggc ctg gac tcc atc ggc gcg   1824
Ser Pro Asp Lys Asp Phe Arg Gln Leu Gly Leu Asp Ser Ile Gly Ala
            595   600   605

gtg cgg ctg cgg aat ctg ctg cgg gag gag acc ggg ctg ccg ctc ccg   1872
Val Arg Leu Arg Asn Leu Leu Arg Glu Glu Thr Gly Leu Pro Leu Pro
            610   615   620

gcc acc ctg gcc ttc gac tcc ccc act ccg cga gcc gtc gcg cgc gtc   1920
Ala Thr Leu Ala Phe Asp Ser Pro Thr Pro Arg Ala Val Ala Arg Val
625   630   635   640

ctg gcc gag cag gag gag ccg tcc cag gac gag ccg agg gag aac ccg   1968
Leu Ala Glu Gln Glu Glu Pro Ser Gln Asp Glu Pro Arg Glu Asn Pro
                645   650   655

gcg gac ggt gcc gac ccg gtg gcg atc gtg ggc atg gcc tgc cgg ctg   2016
Ala Asp Gly Ala Asp Pro Val Ala Ile Val Gly Met Ala Cys Arg Leu
            660   665   670

ccg ggc gga gcc gac tcc ccc gac gcc ctg tgg gag ctg ctc gcc gac   2064
Pro Gly Gly Ala Asp Ser Pro Asp Ala Leu Trp Glu Leu Leu Ala Asp
            675   680   685

ggg acc gac gcg atg tcc ccc ttc ccc acg gac cgc ggc tgg gac ctg   2112
Gly Thr Asp Ala Met Ser Pro Phe Pro Thr Asp Arg Gly Trp Asp Leu
            690   695   700

gac cgg ctg ttc gac gag gat gcc gac cgc ccg ggt acc tcg tac gcc   2160
Asp Arg Leu Phe Asp Glu Asp Ala Asp Arg Pro Gly Thr Ser Tyr Ala
705   710   715   720

cgc gaa ggc ggc ttc ctg cac gac gcg ggc gac ttc gac gcg ggc ttc   2208
Arg Glu Gly Gly Phe Leu His Asp Ala Gly Asp Phe Asp Ala Gly Phe
                725   730   735

ttc ggc ctg tcg gac cag gag gcg acg gcg acc gat ccg cag cag cgg   2256
Phe Gly Leu Ser Asp Gln Glu Ala Thr Ala Thr Asp Pro Gln Gln Arg
            740   745   750

ctg ctt ctg gag gcg gcc tgg gag acc ttc gag cgg gcg ggc atc gac   2304
Leu Leu Leu Glu Ala Ala Trp Glu Thr Phe Glu Arg Ala Gly Ile Asp
            755   760   765

ccg cag tcc ctg agg gga agc cgt acg ggc gtg ttc acg ggc gcg atg   2352
Pro Gln Ser Leu Arg Gly Ser Arg Thr Gly Val Phe Thr Gly Ala Met
            770   775   780

gac cgc ggc tat gga acc agc gcg tcc gcc gcg ccc agc gca tgg gag   2400
Asp Arg Gly Tyr Gly Thr Ser Ala Ser Ala Ala Pro Ser Ala Trp Glu
785   790   795   800

agc atg ctc atc acc ggg acc gcc ggc agc gcg gtc tcg ggg cgc atc   2448
Ser Met Leu Ile Thr Gly Thr Ala Gly Ser Ala Val Ser Gly Arg Ile

4

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gcc tac acc tac ggg ctc gaa ggc ccc gcg ctg acg gtc gac acc gcc    2496
Ala Tyr Thr Tyr Gly Leu Glu Gly Pro Ala Leu Thr Val Asp Thr Ala
            820                    825                    830

tcc tcg tcc tcc ctc gtc gcc ctg cat ctg gcc tgc cgg tcg ctg cgc    2544
Ser Ser Ser Ser Leu Val Ala Leu His Leu Ala Cys Arg Ser Leu Arg
            835                    840                    845

tcg ggc gag acc gac ctg gcg ctg gcc ggc ggc gtc acc gtc atg gcg    2592
Ser Gly Glu Thr Asp Leu Ala Leu Ala Gly Gly Val Thr Val Met Ala
            850                    855                    860

acc ccg gcg ccc ttc gca cac ttc tcc cgg ctg cgc gcg ctg tcc ccc    2640
Thr Pro Ala Pro Phe Ala His Phe Ser Arg Leu Arg Ala Leu Ser Pro
865                    870                    875                    880

gac tcc cgc tcc atg gcg tac gcg gac gcc gcg aac ggc tcg gcg tgg    2688
Asp Ser Arg Ser Met Ala Tyr Ala Asp Ala Ala Asn Gly Ser Ala Trp
                    885                    890                    895

tcg gag ggc gcg ggg ctg ctt ctg ctg gag cgg ctg agc gac gcc cgg    2736
Ser Glu Gly Ala Gly Leu Leu Leu Leu Glu Arg Leu Ser Asp Ala Arg
            900                    905                    910

cgc aac gga cac cgt gtc ctg gcg ctc gta cgg ggc tcc gcc gtg aat    2784
Arg Asn Gly His Arg Val Leu Ala Leu Val Arg Gly Ser Ala Val Asn
            915                    920                    925

cag gac ggc gcc tcc aac ggg ctc acc gcg ccg agc gga ccc gca cag    2832
Gln Asp Gly Ala Ser Asn Gly Leu Thr Ala Pro Ser Gly Pro Ala Gln
            930                    935                    940

cag cgc gtc atc cgc cag gcc ctg gcc gac gcc ggg ctg acg ccg cag    2880
Gln Arg Val Ile Arg Gln Ala Leu Ala Asp Ala Gly Leu Thr Pro Gln
945                    950                    955                    960

gac gtg gac gcc gtg gag ggg cac ggc acc ggc acg ccg ctc ggc gac    2928
Asp Val Asp Ala Val Glu Gly His Gly Thr Gly Thr Pro Leu Gly Asp
                    965                    970                    975

ccc atc gag gcg cag gcg ctg ctg gcc acg tac ggc caa cag cgg cct    2976
Pro Ile Glu Ala Gln Ala Leu Leu Ala Thr Tyr Gly Gln Gln Arg Pro
            980                    985                    990

gtg gaa cgg ccg ttg tgg ctg ggg tcg gtg aag tcg aac ttc ggg cac    3024
Val Glu Arg Pro Leu Trp Leu Gly Ser Val Lys Ser Asn Phe Gly His
            995                    1000                   1005

aca caa gcc gcc gcc ggg gtc gtc ggc gtc atc aag acg gtg ctc gcg    3072
Thr Gln Ala Ala Ala Gly Val Val Gly Val Ile Lys Thr Val Leu Ala
            1010                   1015                   1020

ctg cgc cac ggc gtc ctg ccg cag acg ctg cac gtg gac gct ccc tcg    3120
Leu Arg His Gly Val Leu Pro Gln Thr Leu His Val Asp Ala Pro Ser
1025                   1030                   1035                   1040
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5

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gcc aag gtg gac tgg tcc gcc ggt tcg gta cgg ctg ctg acc gag gcg    3168
Ala Lys Val Asp Trp Ser Ala Gly Ser Val Arg Leu Leu Thr Glu Ala
            1045                1050                1055

cgg ccc tgg cca cgg gag agc gga cgt acg cgc cgg gcg ggg gtg tcc    3216
Arg Pro Trp Pro Arg Glu Ser Gly Arg Thr Arg Arg Ala Gly Val Ser
            1060                1065                1070

tcg ttc ggg ctc acc ggc acc aac gcg cac gtg atc ctg gag gag gcg    3264
Ser Phe Gly Leu Thr Gly Thr Asn Ala His Val Ile Leu Glu Glu Ala
            1075                1080                1085

ccg gga gag gcg gcg gca ggg gcg cgg gcc gag gtt ccc gag gag gcg    3312
Pro Gly Glu Ala Ala Ala Gly Ala Arg Ala Glu Val Pro Glu Glu Ala
            1090                1095                1100

cgg tgc gcc tcc tca ccg gct cga ctc ccg gag ccg ccc ggc gac gcg    3360
Arg Cys Ala Ser Ser Pro Ala Arg Leu Pro Glu Pro Pro Gly Asp Ala
1105                1110                1115                1120

gcc gcg ccc tgg gtg ctg tcc gcc cgg agc cgg gcg gcg ctg cgc gcg    3408
Ala Ala Pro Trp Val Leu Ser Ala Arg Ser Arg Ala Ala Leu Arg Ala
            1125                1130                1135

cag gcg ctc cgc ctg gcc gac cag gtg gcc gcc gac ccc ggt cta cgg    3456
Gln Ala Leu Arg Leu Ala Asp Gln Val Ala Ala Asp Pro Gly Leu Arg
            1140                1145                1150

gcc cag gat gtc gcc cat gcc ctg gcc acc tcc cgt acc ctg cac cgg    3504
Ala Gln Asp Val Ala His Ala Leu Ala Thr Ser Arg Thr Leu His Arg
            1155                1160                1165

cac cgg gcc gtc gtc agc ggc tcc gac cgg gca caa atg ctc gcc gcg    3552
His Arg Ala Val Val Ser Gly Ser Asp Arg Ala Gln Met Leu Ala Ala
            1170                1175                1180

gca aag cgg ttc ggg ctc ggt gag cgg acc gcg ggc gtc acc ccg gac    3600
Ala Lys Arg Phe Gly Leu Gly Glu Arg Thr Ala Gly Val Thr Pro Asp
1185                1190                1195                1200

gat tcc gcg ccg ggc ctg ctg gcc ttc gtc ttc tcc ggg cag ggc agc    3648
Asp Ser Ala Pro Gly Leu Leu Ala Phe Val Phe Ser Gly Gln Gly Ser
            1205                1210                1215

cag cgc agc ggc atg ggg cgc gcg gcg gcc gag gcg ttc ccg gtc ttc    3696
Gln Arg Ser Gly Met Gly Arg Ala Ala Ala Glu Ala Phe Pro Val Phe
            1220                1225                1230

gga cgg gcg ctg ggc gag gtg tgc gcc gcg ctg gac ccg ctg ctg aca    3744
Gly Arg Ala Leu Gly Glu Val Cys Ala Ala Leu Asp Pro Leu Leu Thr
            1235                1240                1245

cgc cca ctg acc tcg gtg atg tgg gcg gct ccc ggc tcc gag gag gcg    3792
Arg Pro Leu Thr Ser Val Met Trp Ala Ala Pro Gly Ser Glu Glu Ala
            1250                1255                1260
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6

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gcc cgt ctc gac gac acc acc tac acg cag ccc gcc ctg ttc gcc gtc    3840
Ala Arg Leu Asp Asp Thr Thr Tyr Thr Gln Pro Ala Leu Phe Ala Val
1265                1270            1275                1280

cag gtc gcc ctg tac cgg ctg ttc gag tcc tgg ggc gtg gtg ccg gac    3888
Gln Val Ala Leu Tyr Arg Leu Phe Glu Ser Trp Gly Val Val Pro Asp
                    1285            1290                1295

cag ctg gtg ggg cat tcg gtc ggc gag atc tcc gcc gcc cat gtg gca    3936
Gln Leu Val Gly His Ser Val Gly Glu Ile Ser Ala Ala His Val Ala
                1300            1305                1310

ggc gtg ctc ggc ctc cgg gac gcg tgc acc ctg gtg gcg gcc cgt agc    3984
Gly Val Leu Gly Leu Arg Asp Ala Cys Thr Leu Val Ala Ala Arg Ser
            1315            1320                1325

agg ctg atg ggc gcg ctg ccg ccc ggc ggt gcg atg gtg gcg gta cgc    4032
Arg Leu Met Gly Ala Leu Pro Pro Gly Gly Ala Met Val Ala Val Arg
            1330            1335                1340

atc acg gaa ccc gaa gtg acc cca tgg ctc gcg gag ttg acg gac gag    4080
Ile Thr Glu Pro Glu Val Thr Pro Trp Leu Ala Glu Leu Thr Asp Glu
1345                1350            1355                1360

gtg tcg atc gcg gcc gtc aac ggt ccg cac tcc ctc gtg ctc gcg ggc    4128
Val Ser Ile Ala Ala Val Asn Gly Pro His Ser Leu Val Leu Ala Gly
                1365            1370                1375

gcc gag gcc ccg ctc gtc gcc ctc acg gac cgg ctc gcc gcc gcc gga    4176
Ala Glu Ala Pro Leu Val Ala Leu Thr Asp Arg Leu Ala Ala Ala Gly
            1380            1385                1390

cac aag acc cgg cgc ctc atg gtg agc acc gcg ccc cac tcg ccg ctg    4224
His Lys Thr Arg Arg Leu Met Val Ser Thr Ala Pro His Ser Pro Leu
            1395            1400                1405

atg gac ccc atg ctg gag gag ttc cgc gcg gtc gtc cgc acg ctg tcc    4272
Met Asp Pro Met Leu Glu Glu Phe Arg Ala Val Val Arg Thr Leu Ser
    1410            1415            1420

tac gcc gcg ccc gcc gtt ccc ctc gtc tcc acc gtc acc ggc cgc ccg    4320
Tyr Ala Ala Pro Ala Val Pro Leu Val Ser Thr Val Thr Gly Arg Pro
1425            1430            1435                1440

ctg acc ggc gag gag gcg cgc gac ccg gac cac tgg gtg cgg cat gtg    4368
Leu Thr Gly Glu Glu Ala Arg Asp Pro Asp His Trp Val Arg His Val
                1445            1450                1455

cgg cag tcc gtc cgc ttc aag gac gcg atc ggc cgg ctc cgg gac gaa    4416
Arg Gln Ser Val Arg Phe Lys Asp Ala Ile Gly Arg Leu Arg Asp Glu
                1460            1465                1470

cgc gtc acc ggg ttc ctg gag ctg ggt gcc gaa ccg gca ctc aca ccg    4464
Arg Val Thr Gly Phe Leu Glu Leu Gly Ala Glu Pro Ala Leu Thr Pro
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atg atc gac gag tgc ctg gag tcc gcc gac ggg cag ccc ggg acc gcc    4512
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7

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Met Ile Asp Glu Cys Leu Glu Ser Ala Asp Gly Gln Pro Gly Thr Ala
    1490              1495              1500

ctg gtg ccg agt ctg cgc gcc gga gtg ccg gag cgg gat gcc ctg ctc    4560
Leu Val Pro Ser Leu Arg Ala Gly Val Pro Glu Arg Asp Ala Leu Leu
1505              1510              1515              1520

acc gcg gtc gcc cgg gtg cac gcc cag ggc gtt ccc gtc gac tgg gac    4608
Thr Ala Val Ala Arg Val His Ala Gln Gly Val Pro Val Asp Trp Asp
                  1525              1530              1535

gcg gtg ctc ccc ggg gcc gag gct tcc gtc acc gtg cgc gga ctg ccc    4656
Ala Val Leu Pro Gly Ala Glu Ala Ser Val Thr Val Arg Gly Leu Pro
                  1540              1545              1550

gcc gcc gac cgc cag tgg ttc cgc ttc gtc ccc gac cag ggc gcg ccg    4704
Ala Ala Asp Arg Gln Trp Phe Arg Phe Val Pro Asp Gln Gly Ala Pro
                  1555              1560              1565

ctc acc ctc gcc gac cgc tcg ctg cac ctg gag ggc gcc gcc cac ctc    4752
Leu Thr Leu Ala Asp Arg Ser Leu His Leu Glu Gly Ala Ala His Leu
         1570              1575              1580

cgc gac gtg ggc ggc tgt cgc acc gcc gac ggc cgg tgg gtg aaa atg    4800
Arg Asp Val Gly Gly Cys Arg Thr Ala Asp Gly Arg Trp Val Lys Met
1585              1590              1595              1600

ggc gtc ctg tac cgc acc aac aat ctg cac gcg ctc acc gac gcc gac    4848
Gly Val Leu Tyr Arg Thr Asn Asn Leu His Ala Leu Thr Asp Ala Asp
                  1605              1610              1615

ctg gcc aag ctc cag cgc ctc ggc atc cgt acg gac ttc gac ctg cgc    4896
Leu Ala Lys Leu Gln Arg Leu Gly Ile Arg Thr Asp Phe Asp Leu Arg
                  1620              1625              1630

atg ccg ggc gag cgc gcc aaa gcc ccg aac cgc gtg ccc acg ggc gcg    4944
Met Pro Gly Glu Arg Ala Lys Ala Pro Asn Arg Val Pro Thr Gly Ala
         1635              1640              1645

cgc tat atc gtc gcc gat gcc ttt gac gca cat ctg cgg gac ggg ctg    4992
Arg Tyr Ile Val Ala Asp Ala Phe Asp Ala His Leu Arg Asp Gly Leu
    1650              1655              1660

agt ctg agc gag cgg gac ctg gag cgg ctg cgc gag gcc cgg ctg tcc    5040
Ser Leu Ser Glu Arg Asp Leu Glu Arg Leu Arg Glu Ala Arg Leu Ser
1665              1670              1675              1680

ggt ctc gac gag gcc gaa cag cac gcg ctc gta ctg gcc ctg gtc ctc    5088
Gly Leu Asp Glu Ala Glu Gln His Ala Leu Val Leu Ala Leu Val Leu
                  1685              1690              1695

gcc gag acc tcg gcc gtg ctc ggc ggc cag gag acg cct ggc gag gag    5136
Ala Glu Thr Ser Ala Val Leu Gly Gly Gln Glu Thr Pro Gly Glu Glu
                  1700              1705              1710

ccg cac ggc gag gag ggc cac cgc acg ttc aag gag atg ggc atc aac    5184
Pro His Gly Glu Glu Gly His Arg Thr Phe Lys Glu Met Gly Ile Asn
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8

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              1715                    1720                    1725
tcg ttg aac gcc gtc gaa ctg cgc aac cgc ctt atc gca gcc acg gac    5232
Ser Leu Asn Ala Val Glu Leu Arg Asn Arg Leu Ile Ala Ala Thr Asp
      1730                    1735                    1740

ctg cgg ctt ccc gcc acg ctc gtc tac gac tac ccc acg ccg aag gcc    5280
Leu Arg Leu Pro Ala Thr Leu Val Tyr Asp Tyr Pro Thr Pro Lys Ala
1745                    1750                    1755                    1760

gtc gtc cga ctc gta cgc gaa cga ctc gcg cga ccg gcc tcc ccc gca    5328
Val Val Arg Leu Val Arg Glu Arg Leu Ala Arg Pro Ala Ser Pro Ala
                  1765                    1770                    1775

cgc gat gtg gcc tcc gtc gtg gcc gag ttg gag tcc ctg ctg acg gcc    5376
Arg Asp Val Ala Ser Val Val Ala Glu Leu Glu Ser Leu Leu Thr Ala
              1780                    1785                    1790

ggt gcg gag gtc tcg gag gag acc gcg gcg cgg ttg aaa gcg gtg acg    5424
Gly Ala Glu Val Ser Glu Glu Thr Ala Ala Arg Leu Lys Ala Val Thr
          1795                    1800                    1805

gcg gtg tcg acg ggg acg acg ggg tcg ggc agc ggt acg ggc gcc ggc    5472
Ala Val Ser Thr Gly Thr Thr Gly Ser Gly Ser Gly Thr Gly Ala Gly
      1810                    1815                    1820

tcc ggc ggg gct ctg gac ctg gta tcg gcc agt gac gag gaa ctg ttc    5520
Ser Gly Gly Ala Leu Asp Leu Val Ser Ala Ser Asp Glu Glu Leu Phe
1825                    1830                    1835                    1840

cgg ctg atg gac gcg gag agc tga                                     5544
Arg Leu Met Asp Ala Glu Ser
                  1845


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Met Val Pro Val His Thr Asp Asp Tyr Ala Ile Gln Pro Pro Ala Asp
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              20                  25                  30

Ala Val Glu Ser Ala Pro Asp Ala Val Ala Leu Val Asp Gly Thr Val
          35                  40                  45

Pro Gly Pro Gly Arg Met Trp Arg Ala Asp Val Asp Ala Leu Ala Arg
      50                  55                  60

Gly Leu Gln Glu Ser Gly Ile Ala Pro Gly Asp Val Val Ala Val Arg
  65                  70                  75                  80

Leu Pro Asn Cys Gly Arg Phe Pro Thr Leu His Leu Ala Val Ala Ala
```

9

Val Gly Ala Val Leu Leu Pro Ile His Gln Gly Thr Pro Leu Pro Glu
        100   105   110

Val Asp Ala Leu Leu Thr Arg Ala Glu Pro Ala Leu Leu Val Leu Ser
        115   120   125

Ala Ala Gly Ser Asp Gly Leu Ala Thr Ala Arg Ser Leu Leu Glu Ser
        130   135   140

Val Pro Ser Leu Arg Gly Val Leu Leu Ala Gly Ala Ser Gly Asp Gly
145   150   155   160

Glu Ser Gly Ser Val Gly Gly Gly Glu Ser Gly Ser Gly Arg Arg Ser
                165   170   175

Leu Asp Gly Leu Leu Ala Gly Trp Ala Gly Ser Gly Pro Arg Pro Val
        180   185   190

Asp Val Thr Pro Asp Met Pro Leu Val Leu Val Pro Ser Ser Gly Thr
        195   200   205

Val Ser Ala Arg Pro Lys Leu Cys Val His Ser His Asp Gly Leu Leu
210   215   220

Ser Asn Thr Ala Ala Val Thr Ala Glu Ala Ala Asp Ala Phe Asp Gly
225   230   235   240

Pro Val Leu Thr Ala Cys Pro Met Thr His Leu Phe Gly Leu Gln Ser
        245   250   255

Leu His Ala Ala Leu Phe Ala Ala Cys Thr Gln Val Leu Leu Thr Gly
        260   265   270

Trp Asp Val Asp Arg Phe Leu Glu Gln Ala Arg Glu His Gly Pro Arg
        275   280   285

Val Val Phe Ala Val Pro Ala Gln Leu Arg Asp Val Val Thr Arg Leu
        290   295   300

Ala Arg Thr Gly Glu Pro Ala Gly Phe Thr Pro Tyr Gln Val Arg Thr
305   310   315   320

Ala Gly Ala Ala Val Ala Pro Ala Leu Ala Val Arg Val Arg Ala Val
                325   330   335

Leu Asp Cys Glu Leu Val Val Val Trp Gly Met Ser Glu Ile Gly Thr
        340   345   350

Gly Thr Arg Thr Arg Ala His His Pro Asp Gly Cys Val Gly Glu Pro
        355   360   365

Val Ser Gly Val Asp Val Arg Val Val Asp Glu His Gly Gln Glu Cys
        370   375   380

Ala Ala Asp Glu Arg Gly Glu Leu Gln Tyr Arg Gly Pro Gly Leu Phe

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385                    390                    395                    400

Arg Gly Tyr Phe Arg Glu Pro Glu Leu Thr Arg Ser Ala Leu Thr Asp
            405               410               415

Asp Gly Trp Leu Arg Thr Gly Asp Leu Ala Thr Val Asp Ala Asp Gly
            420               425               430

Val Val Val Leu His Gly Arg Ala Ala Glu Leu Ile Asn Thr Gly Gly
            435               440               445

Arg Lys Phe Ser Ala Gly Glu Val Glu Gly Leu Leu Ser Gly Phe Thr
    450               455               460

Asp Leu Gly Pro Leu Ala Val Val Gly Ala Pro Asp Asp Arg Leu Gly
465               470               475               480

Glu Tyr Pro Cys Leu Val Val Thr Asp His Ala Asp Gly Thr Ile Gly
            485               490               495

Leu Ser Glu Val Thr Ala Phe Leu Arg Arg Leu Gly Leu Ala Asp His
            500               505               510

Lys Ile Pro Leu Glu Leu Val Thr Val Arg Glu Leu Pro Phe Ser Pro
        515               520               525

Ala Gly Lys Leu Asp Arg Gly Ala Leu Lys Arg Leu Leu Ala Asn Leu
    530               535               540

Ala Glu Val Ser Val Pro Ala Arg Leu Gly Ala Val Pro Pro Tyr Thr
545               550               555               560

Ala Glu Glu Ala Leu Asp Leu Val Arg Asp Cys Val Gly Arg Val Leu
            565               570               575

Arg Tyr Gly Gly Ala Ala Val Pro Phe Pro Pro Asp Lys Asp Phe Phe
            580               585               590

Ser Pro Asp Lys Asp Phe Arg Gln Leu Gly Leu Asp Ser Ile Gly Ala
        595               600               605

Val Arg Leu Arg Asn Leu Leu Arg Glu Glu Thr Gly Leu Pro Leu Pro
    610               615               620

Ala Thr Leu Ala Phe Asp Ser Pro Thr Pro Arg Ala Val Ala Arg Val
625               630               635               640

Leu Ala Glu Gln Glu Glu Pro Ser Gln Asp Glu Pro Arg Glu Asn Pro
            645               650               655

Ala Asp Gly Ala Asp Pro Val Ala Ile Val Gly Met Ala Cys Arg Leu
            660               665               670

Pro Gly Gly Ala Asp Ser Pro Asp Ala Leu Trp Glu Leu Leu Ala Asp
        675               680               685

Gly Thr Asp Ala Met Ser Pro Phe Pro Thr Asp Arg Gly Trp Asp Leu
```

Asp Arg Leu Phe Asp Glu Asp Ala Asp Arg Pro Gly Thr Ser Tyr Ala
705   710   715   720

Arg Glu Gly Gly Phe Leu His Asp Ala Gly Asp Phe Asp Ala Gly Phe
                725   730   735

Phe Gly Leu Ser Asp Gln Glu Ala Thr Ala Thr Asp Pro Gln Gln Arg
            740   745   750

Leu Leu Leu Glu Ala Ala Trp Glu Thr Phe Glu Arg Ala Gly Ile Asp
            755   760   765

Pro Gln Ser Leu Arg Gly Ser Arg Thr Gly Val Phe Thr Gly Ala Met
    770   775   780

Asp Arg Gly Tyr Gly Thr Ser Ala Ser Ala Ala Pro Ser Ala Trp Glu
785   790   795   800

Ser Met Leu Ile Thr Gly Thr Ala Gly Ser Ala Val Ser Gly Arg Ile
            805   810   815

Ala Tyr Thr Tyr Gly Leu Glu Gly Pro Ala Leu Thr Val Asp Thr Ala
        820   825   830

Ser Ser Ser Ser Leu Val Ala Leu His Leu Ala Cys Arg Ser Leu Arg
        835   840   845

Ser Gly Glu Thr Asp Leu Ala Leu Ala Gly Gly Val Thr Val Met Ala
    850   855   860

Thr Pro Ala Pro Phe Ala His Phe Ser Arg Leu Arg Ala Leu Ser Pro
865   870   875   880

Asp Ser Arg Ser Met Ala Tyr Ala Asp Ala Ala Asn Gly Ser Ala Trp
            885   890   895

Ser Glu Gly Ala Gly Leu Leu Leu Leu Glu Arg Leu Ser Asp Ala Arg
        900   905   910

Arg Asn Gly His Arg Val Leu Ala Leu Val Arg Gly Ser Ala Val Asn
        915   920   925

Gln Asp Gly Ala Ser Asn Gly Leu Thr Ala Pro Ser Gly Pro Ala Gln
    930   935   940

Gln Arg Val Ile Arg Gln Ala Leu Ala Asp Ala Gly Leu Thr Pro Gln
945   950   955   960

Asp Val Asp Ala Val Glu Gly His Gly Thr Gly Thr Pro Leu Gly Asp
            965   970   975

Pro Ile Glu Ala Gln Ala Leu Leu Ala Thr Tyr Gly Gln Gln Arg Pro
        980   985   990

Val Glu Arg Pro Leu Trp Leu Gly Ser Val Lys Ser Asn Phe Gly His

Thr Gln Ala Ala Ala Gly Val Val Gly Val Ile Lys Thr Val Leu Ala
    1010   1015   1020

Leu Arg His Gly Val Leu Pro Gln Thr Leu His Val Asp Ala Pro Ser
1025   1030   1035   1040

Ala Lys Val Asp Trp Ser Ala Gly Ser Val Arg Leu Leu Thr Glu Ala
                  1045   1050   1055

Arg Pro Trp Pro Arg Glu Ser Gly Arg Thr Arg Arg Ala Gly Val Ser
              1060   1065   1070

Ser Phe Gly Leu Thr Gly Thr Asn Ala His Val Ile Leu Glu Glu Ala
              1075   1080   1085

Pro Gly Glu Ala Ala Ala Gly Ala Arg Ala Glu Val Pro Glu Glu Ala
    1090   1095   1100

Arg Cys Ala Ser Ser Pro Ala Arg Leu Pro Glu Pro Pro Gly Asp Ala
1105   1110   1115   1120

Ala Ala Pro Trp Val Leu Ser Ala Arg Ser Arg Ala Ala Leu Arg Ala
                  1125   1130   1135

Gln Ala Leu Arg Leu Ala Asp Gln Val Ala Ala Asp Pro Gly Leu Arg
              1140   1145   1150

Ala Gln Asp Val Ala His Ala Leu Ala Thr Ser Arg Thr Leu His Arg
              1155   1160   1165

His Arg Ala Val Val Ser Gly Ser Asp Arg Ala Gln Met Leu Ala Ala
              1170   1175   1180

Ala Lys Arg Phe Gly Leu Gly Glu Arg Thr Ala Gly Val Thr Pro Asp
1185   1190   1195   1200

Asp Ser Ala Pro Gly Leu Leu Ala Phe Val Phe Ser Gly Gln Gly Ser
              1205   1210   1215

Gln Arg Ser Gly Met Gly Arg Ala Ala Ala Glu Ala Phe Pro Val Phe
              1220   1225   1230

Gly Arg Ala Leu Gly Glu Val Cys Ala Ala Leu Asp Pro Leu Leu Thr
              1235   1240   1245

Arg Pro Leu Thr Ser Val Met Trp Ala Ala Pro Gly Ser Glu Glu Ala
    1250   1255   1260

Ala Arg Leu Asp Asp Thr Thr Tyr Thr Gln Pro Ala Leu Phe Ala Val
1265   1270   1275   1280

Gln Val Ala Leu Tyr Arg Leu Phe Glu Ser Trp Gly Val Val Pro Asp
                  1285   1290   1295

Gln Leu Val Gly His Ser Val Gly Glu Ile Ser Ala Ala His Val Ala

Gly Val Leu Gly Leu Arg Asp Ala Cys Thr Leu Val Ala Ala Arg Ser
    1315   1320   1325

Arg Leu Met Gly Ala Leu Pro Pro Gly Gly Ala Met Val Ala Val Arg
    1330   1335   1340

Ile Thr Glu Pro Glu Val Thr Pro Trp Leu Ala Glu Leu Thr Asp Glu
1345   1350   1355   1360

Val Ser Ile Ala Ala Val Asn Gly Pro His Ser Leu Val Leu Ala Gly
                1365   1370   1375

Ala Glu Ala Pro Leu Val Ala Leu Thr Asp Arg Leu Ala Ala Ala Gly
                1380   1385   1390

His Lys Thr Arg Arg Leu Met Val Ser Thr Ala Pro His Ser Pro Leu
            1395   1400   1405

Met Asp Pro Met Leu Glu Glu Phe Arg Ala Val Val Arg Thr Leu Ser
    1410   1415   1420

Tyr Ala Ala Pro Ala Val Pro Leu Val Ser Thr Val Thr Gly Arg Pro
1425   1430   1435   1440

Leu Thr Gly Glu Glu Ala Arg Asp Pro Asp His Trp Val Arg His Val
            1445   1450   1455

Arg Gln Ser Val Arg Phe Lys Asp Ala Ile Gly Arg Leu Arg Asp Glu
            1460   1465   1470

Arg Val Thr Gly Phe Leu Glu Leu Gly Ala Glu Pro Ala Leu Thr Pro
        1475   1480   1485

Met Ile Asp Glu Cys Leu Glu Ser Ala Asp Gly Gln Pro Gly Thr Ala
        1490   1495   1500

Leu Val Pro Ser Leu Arg Ala Gly Val Pro Glu Arg Asp Ala Leu Leu
1505   1510   1515   1520

Thr Ala Val Ala Arg Val His Ala Gln Gly Val Pro Val Asp Trp Asp
                1525   1530   1535

Ala Val Leu Pro Gly Ala Glu Ala Ser Val Thr Val Arg Gly Leu Pro
            1540   1545   1550

Ala Ala Asp Arg Gln Trp Phe Arg Phe Val Pro Asp Gln Gly Ala Pro
        1555   1560   1565

Leu Thr Leu Ala Asp Arg Ser Leu His Leu Glu Gly Ala Ala His Leu
    1570   1575   1580

Arg Asp Val Gly Gly Cys Arg Thr Ala Asp Gly Arg Trp Val Lys Met
1585   1590   1595   1600

Gly Val Leu Tyr Arg Thr Asn Asn Leu His Ala Leu Thr Asp Ala Asp

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                1605                    1610                    1615

Leu Ala Lys Leu Gln Arg Leu Gly Ile Arg Thr Asp Phe Asp Leu Arg
            1620                    1625                1630

Met Pro Gly Glu Arg Ala Lys Ala Pro Asn Arg Val Pro Thr Gly Ala
            1635                1640                    1645

Arg Tyr Ile Val Ala Asp Ala Phe Asp Ala His Leu Arg Asp Gly Leu
        1650                    1655                1660

Ser  Leu Ser Glu Arg Asp Leu Glu Arg Leu Arg Glu Ala Arg Leu Ser
1665                    1670                    1675                1680

Gly Leu Asp Glu Ala Glu Gln His Ala Leu Val Leu Ala Leu Val Leu
            1685                    1690                1695

Ala Glu Thr Ser Ala Val Leu Gly Gly Gln Glu Thr Pro Gly Glu Glu
            1700                    1705                1710

Pro His Gly Glu Glu Gly His Arg Thr Phe Lys Glu Met Gly Ile Asn
        1715                    1720                1725

Ser Leu Asn Ala Val Glu Leu Arg Asn Arg Leu Ile Ala Ala Thr Asp
        1730                    1735                1740

Leu  Arg Leu Pro Ala Thr Leu Val Tyr Asp Tyr Pro Thr Pro Lys Ala
1745                    1750                    1755                1760

Val Val Arg Leu Val Arg Glu Arg Leu Ala Arg Pro Ala Ser Pro Ala
                1765                    1770                1775

Arg Asp Val Ala Ser Val Val Ala Glu Leu Glu Ser Leu Leu Thr Ala
            1780                    1785                1790

Gly Ala Glu Val Ser Glu Glu Thr Ala Ala Arg Leu Lys Ala Val Thr
        1795                    1800                    1805

Ala Val Ser Thr Gly Thr Thr Gly Ser Gly Ser Gly Thr Gly Ala Gly
        1810                    1815                    1820

Ser  Gly Gly Ala Leu Asp Leu Val Ser Ala Ser Asp Glu Glu Leu Phe
1825                    1830                    1835                1840

Arg Leu Met Asp Ala Glu Ser
                1845
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15

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Met Ser Asn Glu Glu Lys Leu Arg Glu Tyr Leu Lys Arg Ala Ile Ala
 1               5                  10                  15

gac ctt cac gag act cgt cag caa ttg gac gag acc gag gcg aag cag    96
Asp Leu His Glu Thr Arg Gln Gln Leu Asp Glu Thr Glu Ala Lys Gln
                20                  25                  30

cga gag ccc ctc gcg atc gtg tcg atg gcc tgc cgc ttc ccc ggc ggc   144
Arg Glu Pro Leu Ala Ile Val Ser Met Ala Cys Arg Phe Pro Gly Gly
            35                  40                  45

gtc cgt tcg ccc gag gag ctg tgg gag ctg ctg cgc gac ggc gtc gac   192
Val Arg Ser Pro Glu Glu Leu Trp Glu Leu Leu Arg Asp Gly Val Asp
        50                  55                  60

gcg gtt tcc tcc ttc ccc cgt aac cgc ggc tgg gac ctg gac gcg ctc   240
Ala Val Ser Ser Phe Pro Arg Asn Arg Gly Trp Asp Leu Asp Ala Leu
 65                  70                  75                  80

tac cac tcc gac ccg gcc cac cag ggc acc agc tat gcg cgc gag ggc   288
Tyr His Ser Asp Pro Ala His Gln Gly Thr Ser Tyr Ala Arg Glu Gly
                85                  90                  95

gga ttc ctg cat gac gcg ggc gag ttc gac ccc ggc ttc ttc ggg atc   336
Gly Phe Leu His Asp Ala Gly Glu Phe Asp Pro Gly Phe Phe Gly Ile
            100                 105                 110

tcc ccg cgc gag gcg ctc gcc atg gac ccc cag cag cgg ctg ctg ctg   384
Ser Pro Arg Glu Ala Leu Ala Met Asp Pro Gln Gln Arg Leu Leu Leu
        115                 120                 125

gag acc gca tgg gaa gcc gtc gag cgg gcc ggt atc gac ccg gag tcc   432
Glu Thr Ala Trp Glu Ala Val Glu Arg Ala Gly Ile Asp Pro Glu Ser
        130                 135                 140

ctc gcg ggc agc cga acg ggt gtc ttt gtc ggc acc ggg cac gga ggg   480
Leu Ala Gly Ser Arg Thr Gly Val Phe Val Gly Thr Gly His Gly Gly
145                 150                 155                 160

tac gac gcc gag ggc cga cgg cgt gcc gac gag gtc ggc ggg cac ttg   528
Tyr Asp Ala Glu Gly Arg Arg Arg Ala Asp Glu Val Gly Gly His Leu
                165                 170                 175

ctg acg ggc aat cac atc agc atc gcc tcc ggc cgg att tcg tat gtc   576
Leu Thr Gly Asn His Ile Ser Ile Ala Ser Gly Arg Ile Ser Tyr Val
                180                 185                 190

ctg ggg ctg gaa ggc cct gcc ctg acc gtg gac acg gcc tgc tcc tcg   624
Leu Gly Leu Glu Gly Pro Ala Leu Thr Val Asp Thr Ala Cys Ser Ser
            195                 200                 205

tcg ctg gtc gcc ctg cat ctg gcg atg cac gcg ctg cgg cgc gac gaa   672
Ser Leu Val Ala Leu His Leu Ala Met His Ala Leu Arg Arg Asp Glu
        210                 215                 220
```

16

```
tgc gcc atg gcc ctg gtg ggc ggc gcg acc gtg atg tcc acg ccg cag    720
Cys Ala Met Ala Leu Val Gly Gly Ala Thr Val Met Ser Thr Pro Gln
225                 230                 235                 240

atg ttc gtg gag ttc tcc cgc cag cgc ggc ctt gcc ccc gac ggc cgc    768
Met Phe Val Glu Phe Ser Arg Gln Arg Gly Leu Ala Pro Asp Gly Arg
                    245                 250                 255

tgc aag ccg ttc gcg gcc gcc gcc gac ggc acc ggc tgg agc gag ggt    816
Cys Lys Pro Phe Ala Ala Ala Ala Asp Gly Thr Gly Trp Ser Glu Gly
                260                 265                 270

gtc gga ctg ctg ctc gtc gag cgg ctc agt gac gcc gta cgc aac ggc    864
Val Gly Leu Leu Leu Val Glu Arg Leu Ser Asp Ala Val Arg Asn Gly
                275                 280                 285

tat ccc gtc ctc gcc gtg ctg aag ggc tcg gcc gtc aac cag gac ggc    912
Tyr Pro Val Leu Ala Val Leu Lys Gly Ser Ala Val Asn Gln Asp Gly
    290                 295                 300

gcg tcc aac ggc ctg acc gcc ccc aac ggc ccc tcg cag caa cgc gtc    960
Ala Ser Asn Gly Leu Thr Ala Pro Asn Gly Pro Ser Gln Gln Arg Val
305                 310                 315                 320

atc cgc cag gcg ctg acc ggc gcg ggc ctc gcc gcc tcg gac atc gac   1008
Ile Arg Gln Ala Leu Thr Gly Ala Gly Leu Ala Ala Ser Asp Ile Asp
                325                 330                 335

gcc gtg gag gcg cac ggc acc ggc acc acc ctc ggc gac ccc gtc gag   1056
Ala Val Glu Ala His Gly Thr Gly Thr Thr Leu Gly Asp Pro Val Glu
                340                 345                 350

gcg cac gcc ctg ctg gcc acc tac ggg cag cag cgc gcc gcc gac cgg   1104
Ala His Ala Leu Leu Ala Thr Tyr Gly Gln Gln Arg Ala Ala Asp Arg
                355                 360                 365

ccg tgc gga ctc ggc tcc atg aag tcc aac atc ggg cac acc cag gcc   1152
Pro Cys Gly Leu Gly Ser Met Lys Ser Asn Ile Gly His Thr Gln Ala
    370                 375                 380

gcc gcc ggt atc gcc ggc gtg atg aaa atg gtc ctg gcg atg cgg cac   1200
Ala Ala Gly Ile Ala Gly Val Met Lys Met Val Leu Ala Met Arg His
385                 390                 395                 400

ggg cac ctg ccc agg acc ctg cac ctg gac gag ccc acc ggg cac gtc   1248
Gly His Leu Pro Arg Thr Leu His Leu Asp Glu Pro Thr Gly His Val
                405                 410                 415

gac tgg agc gag ggc aac gcc agg ctc ctc gcg gag ccc gag ccc tgg   1296
Asp Trp Ser Glu Gly Asn Ala Arg Leu Leu Ala Glu Pro Glu Pro Trp
                420                 425                 430

ccg agc gcc ggc cgg ccc cgt cgc gcc gcc gtc tcc tcc ttc ggc atc   1344
Pro Ser Ala Gly Arg Pro Arg Arg Ala Ala Val Ser Ser Phe Gly Ile
    435                 440                 445

agc ggc acc aac gcc cac gtc atc ctg gag cag gcg ccc gcc cac gag   1392
```

17

```
Ser Gly Thr Asn Ala His Val Ile Leu Glu Gln Ala Pro Ala His Glu
    450                 455                 460

gcc gaa ccg gcc ccc gaa ccg gcc gcc cgg ccg ggc gcg ctg ccc tgg    1440
Ala Glu Pro Ala Pro Glu Pro Ala Ala Arg Pro Gly Ala Leu Pro Trp
465                 470                 475                 480

atc ctg tcc gcc cgc acc gaa gcg ggc ctg cgt gcc cag gcc gac cgc    1488
Ile Leu Ser Ala Arg Thr Glu Ala Gly Leu Arg Ala Gln Ala Asp Arg
                485                 490                 495

ctc ggc cgc cac cta cgg gac cgc gcc gac ctc gaa ccg gcc gcc gtc    1536
Leu Gly Arg His Leu Arg Asp Arg Ala Asp Leu Glu Pro Ala Ala Val
                500                 505                 510

gcc cat gcg ctc gcg gac acc cgg acc ctc atg gaa cac cgc gcg gta    1584
Ala His Ala Leu Ala Asp Thr Arg Thr Leu Met Glu His Arg Ala Val
                515                 520                 525

gtc gtc gcg ggc gac cgg gag gag ttc ctg cgc ggc ctg gac gcc ctc    1632
Val Val Ala Gly Asp Arg Glu Glu Phe Leu Arg Gly Leu Asp Ala Leu
        530                 535                 540

gcc gcg ggc cgc acc gcc aac ggc ctg gtc agc ggc gtc gcc gtc aag    1680
Ala Ala Gly Arg Thr Ala Asn Gly Leu Val Ser Gly Val Ala Val Lys
545                 550                 555                 560

gcc gcc agc gcg ttc ctc ttc gcc ggg cag ggc tcc cag cga ccg ggc    1728
Ala Ala Ser Ala Phe Leu Phe Ala Gly Gln Gly Ser Gln Arg Pro Gly
                565                 570                 575

atg ggg cgc gaa ctg cac gcc gcg cac ccc gtg ttc gcc acg gcc ttc    1776
Met Gly Arg Glu Leu His Ala Ala His Pro Val Phe Ala Thr Ala Phe
                580                 585                 590

gac gcg gtg tgc gcc gaa ctg gac cca cac ctg gac cgg ccg ctg cgc    1824
Asp Ala Val Cys Ala Glu Leu Asp Pro His Leu Asp Arg Pro Leu Arg
        595                 600                 605

gac atc gtc ttc gcc gag gaa ggc agc gcc gag gcc gcc ctg ctc gac    1872
Asp Ile Val Phe Ala Glu Glu Gly Ser Ala Glu Ala Ala Leu Leu Asp
        610                 615                 620

cag acc gcc tac acc cag gcc gcg ctc ttc gcc ctg gaa acc gcc ctg    1920
Gln Thr Ala Tyr Thr Gln Ala Ala Leu Phe Ala Leu Glu Thr Ala Leu
625                 630                 635                 640

ttc cgg ctc gtc gaa tcc tgg ggc gtg gca ccc cgg ttc gtc gcc gga    1968
Phe Arg Leu Val Glu Ser Trp Gly Val Ala Pro Arg Phe Val Ala Gly
                645                 650                 655

cac tcc atc ggc gag ctg acc gcc gcc cac gtc agt ggc gtg ctg acc    2016
His Ser Ile Gly Glu Leu Thr Ala Ala His Val Ser Gly Val Leu Thr
                660                 665                 670

ctc cac gac gcc gca cgg ctg gtc gcc gcg cgc ggc acc ctc atg cag    2064
Leu His Asp Ala Ala Arg Leu Val Ala Ala Arg Gly Thr Leu Met Gln
```

18

gcg ctg ccc gca ggc ggc gcc atg gtg gcg gtc cag gcc acc gag gac   2112
Ala Leu Pro Ala Gly Gly Ala Met Val Ala Val Gln Ala Thr Glu Asp
    690   695   700

gag atc cgc gag cgt ctc gcc ggc cac gag gac cac gtc gcc ctc gcg   2160
Glu Ile Arg Glu Arg Leu Ala Gly His Glu Asp His Val Ala Leu Ala
705   710   715   720

gcc gcc aac ggg ccc gat tcc acc gtc att tcg ggc gac gaa cag gcc   2208
Ala Ala Asn Gly Pro Asp Ser Thr Val Ile Ser Gly Asp Glu Gln Ala
            725   730   735

gtc acc gag atc gcg gcc cac tgg gag gca cag ggc cgc cgc acc aag   2256
Val Thr Glu Ile Ala Ala His Trp Glu Ala Gln Gly Arg Arg Thr Lys
            740   745   750

cgg ctg cgg gtc agc cac gcc ttc cac tcc ccg cac atg gac gac atg   2304
Arg Leu Arg Val Ser His Ala Phe His Ser Pro His Met Asp Asp Met
            755   760   765

ctg gag gac ttc cgg cgc gtc gcc cgc ggt ctg acc ttc cac gcc ccc   2352
Leu Glu Asp Phe Arg Arg Val Ala Arg Gly Leu Thr Phe His Ala Pro
    770   775   780

cgc atc ccc gtg gtg tcc acg gtg acc ggc gcg ctc gcc acc gaa gac   2400
Arg Ile Pro Val Val Ser Thr Val Thr Gly Ala Leu Ala Thr Glu Asp
785   790   795   800

gaa ctg cgc tcg ccc gac tac tgg gtg cgg cag gtc cgc gaa acc gtc   2448
Glu Leu Arg Ser Pro Asp Tyr Trp Val Arg Gln Val Arg Glu Thr Val
            805   810   815

cgc ttc tgt gct gcc gtg cgc acc ctt gag gcc gag ggc gtc acc acc   2496
Arg Phe Cys Ala Ala Val Arg Thr Leu Glu Ala Glu Gly Val Thr Thr
            820   825   830

ttc gtg gag atc ggc acc ggc ggc gtc ctc acc ccc atg gtc cag gac   2544
Phe Val Glu Ile Gly Thr Gly Gly Val Leu Thr Pro Met Val Gln Asp
            835   840   845

tgt ctg acc acc ctc gaa gag ccc gtt ctc gtc cct ctg ctg cgc acc   2592
Cys Leu Thr Thr Leu Glu Glu Pro Val Leu Val Pro Leu Leu Arg Thr
    850   855   860

ggc cgc ccc gaa acc gtc gct ctc acc gag ggc gtc gcc acc gcc ttc   2640
Gly Arg Pro Glu Thr Val Ala Leu Thr Glu Gly Val Ala Thr Ala Phe
865   870   875   880

gtg cac ggt gtc ccc gtc gac cgg tcc gcc ttc ccg ggc gcg ccc ggt   2688
Val His Gly Val Pro Val Asp Arg Ser Ala Phe Pro Gly Ala Pro Gly
            885   890   895

acc tcc cgc gcg gac ctg ccc acc tac gcc ttc cag cgt cag tgg tac   2736
Thr Ser Arg Ala Asp Leu Pro Thr Tyr Ala Phe Gln Arg Gln Trp Tyr
            900   905   910

19

```
tgg ctg gac ccg gcc gac cac gac gag ggg gag gcg gcc gcc gcc gaa    2784
Trp Leu Asp Pro Ala Asp His Asp Glu Gly Glu Ala Ala Ala Ala Glu
        915             920             925

gcg ggc gag gcc gga ttc tgg gcg gcc gtc gaa cgc gag gac ctc cag    2832
Ala Gly Glu Ala Gly Phe Trp Ala Ala Val Glu Arg Glu Asp Leu Gln
        930             935             940

gag ctg tcg gcc gtc ctg gcc atc gac ggc agc gaa gcg gac tcc ctc    2880
Glu Leu Ser Ala Val Leu Ala Ile Asp Gly Ser Glu Ala Asp Ser Leu
945                 950             955             960

ggc agc ttc ctg ccc acc ctc tcc tcc tgg cgc agg cag cgc agg acc    2928
Gly Ser Phe Leu Pro Thr Leu Ser Ser Trp Arg Arg Gln Arg Arg Thr
                965             970             975

cag gcc gcc gcg gac cgc ttc agc tac cgc acc cac tgg gcc ccg cgc    2976
Gln Ala Ala Ala Asp Arg Phe Ser Tyr Arg Thr His Trp Ala Pro Arg
                980             985             990

acc gcc tcg ggc ggc ccc acc gcc acc ggg cac tgg ctc gtc gtc ctg    3024
Thr Ala Ser Gly Gly Pro Thr Ala Thr Gly His Trp Leu Val Val Leu
                995             1000            1005

ccc gaa ggc ggc acc gac gac ccg tgg acc gcc cgc ctc ctg gac gcg    3072
Pro Glu Gly Gly Thr Asp Asp Pro Trp Thr Ala Arg Leu Leu Asp Ala
        1010            1015            1020

ctg aac gac cag ggc ctg cac acc gac gta cgc gaa ctg ccc gcc gac    3120
Leu Asn Asp Gln Gly Leu His Thr Asp Val Arg Glu Leu Pro Ala Asp
1025                1030            1035            1040

cac gag ccc gac gcc tgg ggc cga cac ccc gtg gac ggc gtg ctc tgt    3168
His Glu Pro Asp Ala Trp Gly Arg His Pro Val Asp Gly Val Leu Cys
                1045            1050            1055

ctg ctg gca ctc gac gag cgg ccc acc cgc tcc tgc cct ccg tac cgg    3216
Leu Leu Ala Leu Asp Glu Arg Pro Thr Arg Ser Cys Pro Pro Tyr Arg
                1060            1065            1070

cgc ggg ctg gcc gcc acc acc aac gct gct gcg cgc cct gag ggc gcg    3264
Arg Gly Leu Ala Ala Thr Thr Asn Ala Ala Ala Arg Pro Glu Gly Ala
        1075            1080            1085

ggc atc cag gca ccg ctg tgg tgc gtg acc cgc ggc gcc gtc gcc gtc    3312
Gly Ile Gln Ala Pro Leu Trp Cys Val Thr Arg Gly Ala Val Ala Val
        1090            1095            1100

gac cgg cac gag gcg ctc aag agc ccc tta cag gca cag aca tgg ggc    3360
Asp Arg His Glu Ala Leu Lys Ser Pro Leu Gln Ala Gln Thr Trp Gly
1105                1110            1115            1120

ctg ggc cgg gtg gcc gcc ctg gag tcc ccg cag agc tgg ggc ggg ctc    3408
Leu Gly Arg Val Ala Ala Leu Glu Ser Pro Gln Ser Trp Gly Gly Leu
        1125            1130            1135
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20

```
atc gac ctg ccc gac aac ctg gac gga cgg gcc gtc tcc gcg ctg ctg      3456
Ile Asp Leu Pro Asp Asn Leu Asp Gly Arg Ala Val Ser Ala Leu Leu
            1140                1145                1150

agc acc ctc gcc ggg gag gag gac cag gtc gcc gtc cgc ccc gcc ggg      3504
Ser Thr Leu Ala Gly Glu Glu Asp Gln Val Ala Val Arg Pro Ala Gly
            1155                1160                1165

gtc ttc gcc cgc cgc ctg gaa cgg atc aca ccc ggc ggc gac acc ggc      3552
Val Phe Ala Arg Arg Leu Glu Arg Ile Thr Pro Gly Gly Asp Thr Gly
            1170                1175                1180

gac cgg tgg agc acc cac ggc acc gtc ctg gtc acc ggc ggc acc ggt      3600
Asp Arg Trp Ser Thr His Gly Thr Val Leu Val Thr Gly Gly Thr Gly
1185                1190                1195                1200

gcc ctc ggc gcg cac ctc gcc cac tgg ctg gcc gac gcc gga gcc gaa      3648
Ala Leu Gly Ala His Leu Ala His Trp Leu Ala Asp Ala Gly Ala Glu
            1205                1210                1215

cac ctc gtg ctc acc ggc cgc cgc ggc ccg cag gcc ccc ggc gca ccg      3696
His Leu Val Leu Thr Gly Arg Arg Gly Pro Gln Ala Pro Gly Ala Pro
            1220                1225                1230

gaa ctc gcg gcc gcc ctc acc gac cgg ggc gtc aag gtc acc ctc gcc      3744
Glu Leu Ala Ala Ala Leu Thr Asp Arg Gly Val Lys Val Thr Leu Ala
            1235                1240                1245

gcc tgc gac gcc gcc gac cgt gat gcg ctg gcg gcc gtc ctc gcg gac      3792
Ala Cys Asp Ala Ala Asp Arg Asp Ala Leu Ala Ala Val Leu Ala Asp
     1250                1255                1260

atc ccg ccg cac ctg ccg ctg acc ggc gtc gtc cac gcc gcg ggc gta      3840
Ile Pro Pro His Leu Pro Leu Thr Gly Val Val His Ala Ala Gly Val
1265                1270                1275                1280

ctg gac gac ggc gta ctg gac gcg ctc acc ccc gag cgc ttc gag acc      3888
Leu Asp Asp Gly Val Leu Asp Ala Leu Thr Pro Glu Arg Phe Glu Thr
            1285                1290                1295

gta ctg cgc ccc aag gcg cgg gcc gca cag aac ctg cac gaa ctc acc      3936
Val Leu Arg Pro Lys Ala Arg Ala Ala Gln Asn Leu His Glu Leu Thr
            1300                1305                1310

cag gac ctc gac ctg gac cac ttc gtg ctg ttc tcc tcg atc gtc ggc      3984
Gln Asp Leu Asp Leu Asp His Phe Val Leu Phe Ser Ser Ile Val Gly
            1315                1320                1325

gtc ctg ggc aac gcc gga cag gcc aac tac gcc gcc gcc aac gcc tac      4032
Val Leu Gly Asn Ala Gly Gln Ala Asn Tyr Ala Ala Ala Asn Ala Tyr
            1330                1335                1340

ttg gac gcc ctc gcc gaa cac cgt ctc gcc cag ggg ctc ccg gcc acc      4080
Leu Asp Ala Leu Ala Glu His Arg Leu Ala Gln Gly Leu Pro Ala Thr
1345                1350                1355                1360

tcc gtg tcc tgg ggc cct ggg cag gcg gcg gca tgg cac gac agc gac      4128
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                Ser Val Ser Trp Gly Pro Gly Gln Ala Ala Ala Trp His Asp Ser Asp
                          1365             1370             `  1375

gcc gcc gac cgg atg agc cgc gac gga ctg ctg ccc atg gcc gcg gcc      4176
Ala Ala Asp Arg Met Ser Arg Asp Gly Leu Leu Pro Met Ala Ala Ala
              1380             1385             1390

ccg cgt cgc cgc cct gcg cca gcc ctc gcc cag ggc atg aca cag gtg      4224
Pro Arg Arg Arg Pro Ala Pro Ala Leu Ala Gln Gly Met Thr Gln Val
          1395             1400             1405

acc gtg gcc gac atc gac tgg agc gca tac gcc ccc gcc ctg acc gcc      4272
Thr Val Ala Asp Ile Asp Trp Ser Ala Tyr Ala Pro Ala Leu Thr Ala
          1410             1415             1420

gtc cgc ccc agc ccc ctc atc ggc gac ctg ccc gag gca cgc cgc gcg      4320
Val Arg Pro Ser Pro Leu Ile Gly Asp Leu Pro Glu Ala Arg Arg Ala
1425             1430             1435             1440

ctc ggc ccc gca gaa ggc ccc cgc cgg gaa cgc tcc ccc ctg cgc gac      4368
Leu Gly Pro Ala Glu Gly Pro Arg Arg Glu Arg Ser Pro Leu Arg Asp
              1445             1450             1455

cgg atc ggc gca ctg ccg ccc gcc gaa cag gaa aag gca ttc ctg acc      4416
Arg Ile Gly Ala Leu Pro Pro Ala Glu Gln Glu Lys Ala Phe Leu Thr
              1460             1465             1470

atg gtc agg gaa gag gcc gcg agg gta ctg gga cac ccc tcg ccg gac      4464
Met Val Arg Glu Glu Ala Ala Arg Val Leu Gly His Pro Ser Pro Asp
          1475             1480             1485

acc gtc gat gcc caa cgc gcc ttc cgc gag cag ggg ttc gac tcc ctg      4512
Thr Val Asp Ala Gln Arg Ala Phe Arg Glu Gln Gly Phe Asp Ser Leu
          1490             1495             1500

atg gcc gtc gac ctg cgc aac cgg ctc tcc gcc gcg acg ggc ctg cgg      4560
Met Ala Val Asp Leu Arg Asn Arg Leu Ser Ala Ala Thr Gly Leu Arg
1505             1510             1515             1520

ctg ccc gcc acc ctg ctg ttc gac cac ccc acc ccc ctt gcg gcc gcc      4608
Leu Pro Ala Thr Leu Leu Phe Asp His Pro Thr Pro Leu Ala Ala Ala
              1525             1530             1535

gcc tgc ctg cgc tcc gaa gtc ctg ggc gcc gca gga ccc gcc acg gtc      4656
Ala Cys Leu Arg Ser Glu Val Leu Gly Ala Ala Gly Pro Ala Thr Val
              1540             1545             1550

gtt cag gca tcg acc gcc gcc ctc gac gaa ccg gtg gcg atc atc ggc      4704
Val Gln Ala Ser Thr Ala Ala Leu Asp Glu Pro Val Ala Ile Ile Gly
          1555             1560             1565

atg gcc tgc cgc ttc ccc ggc ggc gtg cac tca ccc gag gcc ctg tgg      4752
Met Ala Cys Arg Phe Pro Gly Gly Val His Ser Pro Glu Ala Leu Trp
1570             1575             1580

cgg ctg ctg gcc gag ggc ggc gac gcc atc acc ccc atg ccc gcc gac      4800
Arg Leu Leu Ala Glu Gly Gly Asp Ala Ile Thr Pro Met Pro Ala Asp
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cgg ggc tgg gac ctg gac cgg ctc tac cac ccc gac ccc gac cac cag    4848
Arg Gly Trp Asp Leu Asp Arg Leu Tyr His Pro Asp Pro Asp His Gln
            1605                1610                1615

ggc acc agc tac gcc cgc ggc ggc ggc ttc ctg gac ggc gcg gcc gac    4896
Gly Thr Ser Tyr Ala Arg Gly Gly Gly Phe Leu Asp Gly Ala Ala Asp
            1620                1625                1630

ttc gac gcg gac ttc ttc ggc atc tcg ccg cgc gag gcc ctc gcc atg    4944
Phe Asp Ala Asp Phe Phe Gly Ile Ser Pro Arg Glu Ala Leu Ala Met
            1635                1640                1645

gac ccg cag cag cgg ctg ctc ctg gaa aca tgg gag gtg ctc gaa cag    4992
Asp Pro Gln Gln Arg Leu Leu Leu Glu Thr Trp Glu Val Leu Glu Gln
        1650                1655                1660

gcg ggg atc gac ccg gaa tcc ctg cgg ggc agc agc acc ggt gtc ttc    5040
Ala Gly Ile Asp Pro Glu Ser Leu Arg Gly Ser Ser Thr Gly Val Phe
1665                1670                1675                1680

gcg ggc acc aac acc cag gac tac ggc acg gcc ctg gac gcg gca cag    5088
Ala Gly Thr Asn Thr Gln Asp Tyr Gly Thr Ala Leu Asp Ala Ala Gln
                1685                1690                1695

gac gaa gcc ggc gga cac cgg ctc acc ggc aac gcg atg agc gtc gtc    5136
Asp Glu Ala Gly Gly His Arg Leu Thr Gly Asn Ala Met Ser Val Val
            1700                1705                1710

tcc ggc cgg gtc tcc tac acc ttc ggc ttc gag gga ccg gcc ctc acc    5184
Ser Gly Arg Val Ser Tyr Thr Phe Gly Phe Glu Gly Pro Ala Leu Thr
            1715                1720                1725

gtg gac acg gcg tgc tcc tcc tcg ctg gtg gcc ctg cac atg gcc gcg    5232
Val Asp Thr Ala Cys Ser Ser Ser Leu Val Ala Leu His Met Ala Ala
        1730                1735                1740

cag gcg ctg cgc cag ggc gaa tgc tcc ctg gcg gtc gcg ggc ggt gtg    5280
Gln Ala Leu Arg Gln Gly Glu Cys Ser Leu Ala Val Ala Gly Gly Val
1745                1750                1755                1760

acg gtg atg gcc acc ccg tcc tcc ttc gtg gag ttc gcc cgg cag cgc    5328
Thr Val Met Ala Thr Pro Ser Ser Phe Val Glu Phe Ala Arg Gln Arg
                1765                1770                1775

ggg ctg gcc ccc gac ggc cgc tgc aag ccg ttc gcg gcg gcc gcc gac    5376
Gly Leu Ala Pro Asp Gly Arg Cys Lys Pro Phe Ala Ala Ala Ala Asp
                1780                1785                1790

ggc acc ggc tgg agc gag ggc gtc ggc ctg ctg ctc gtg gaa cgg ctc    5424
Gly Thr Gly Trp Ser Glu Gly Val Gly Leu Leu Leu Val Glu Arg Leu
            1795                1800                1805

agc gac gcc cgc cga aac ggc cac cag gtg ctc gcc gtc gtc cgc ggt    5472
Ser Asp Ala Arg Arg Asn Gly His Gln Val Leu Ala Val Val Arg Gly
            1810                1815                1820
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tcg gcg gtc aac cag gac ggc gcg tcc aac ggt ctg agc gca ccc agc    5520
Ser Ala Val Asn Gln Asp Gly Ala Ser Asn Gly Leu Ser Ala Pro Ser
1825              1830              1835              1840

ggc ccg tcc cag cag cgg gtg atc cgg cag gcc ctg gcg aac gcc cgg    5568
Gly Pro Ser Gln Gln Arg Val Ile Arg Gln Ala Leu Ala Asn Ala Arg
                 1845              1850              1855

gtg gcc gcc tcc gag gtc gac gcc gtg gag gcc cac ggc acg ggc acc    5616
Val Ala Ala Ser Glu Val Asp Ala Val Glu Ala His Gly Thr Gly Thr
                 1860              1865              1870

acg ctc ggt gac ccg atc gag gcc cag gcg ctg ctg gcc acc tac ggc    5664
Thr Leu Gly Asp Pro Ile Glu Ala Gln Ala Leu Leu Ala Thr Tyr Gly
                 1875              1880              1885

cag gag cgg ccg ctg ctg ctc ggc gcg gtg aag tcc aac ctc ggc cac    5712
Gln Glu Arg Pro Leu Leu Leu Gly Ala Val Lys Ser Asn Leu Gly His
     1890              1895              1900

acc cag gcc gcc gcc ggt gtg gcg ggc gtg atg aag atg gtg ctg gcg    5760
Thr Gln Ala Ala Ala Gly Val Ala Gly Val Met Lys Met Val Leu Ala
1905              1910              1915              1920

atg cgg cac ggc atg ctg ccg cgc acc ctg cac gtc gac gag ccc acc    5808
Met Arg His Gly Met Leu Pro Arg Thr Leu His Val Asp Glu Pro Thr
                 1925              1930              1935

ggg cat gtc gac tgg acc gcg ggc gcg gtc gag ctg ctc acc gag cac    5856
Gly His Val Asp Trp Thr Ala Gly Ala Val Glu Leu Leu Thr Glu His
                 1940              1945              1950

acg gac tgg ccc gag acc ggc cac ccc cgg cgc gcc gcg gtc tcc gcg    5904
Thr Asp Trp Pro Glu Thr Gly His Pro Arg Arg Ala Ala Val Ser Ala
     1955              1960              1965

ttc ggc atc agc ggc acc aat gcg cac gtg gtg ctg gaa ctg ccc gca    5952
Phe Gly Ile Ser Gly Thr Asn Ala His Val Val Leu Glu Leu Pro Ala
     1970              1975              1980

gcc gaa cag ccc ttg gtc gaa cag ccc tcg gcc gcg gag ccc gac gcg    6000
Ala Glu Gln Pro Leu Val Glu Gln Pro Ser Ala Ala Glu Pro Asp Ala
1985              1990              1995              2000

ccg gcc acc gct ccc gac cgg acg ccc acc gcc tcc gac ggg acg gcg    6048
Pro Ala Thr Ala Pro Asp Arg Thr Pro Thr Ala Ser Asp Gly Thr Ala
                 2005              2010              2015

ccg ctg ctg ctc tcc gcc aag agc gag agc gcc ctg cgc gcc cag gcg    6096
Pro Leu Leu Leu Ser Ala Lys Ser Glu Ser Ala Leu Arg Ala Gln Ala
                 2020              2025              2030

gcc cgg ctg cac tcc cac ctg gag cgc gac ccc gcg ctc cgg ctc acg    6144
Ala Arg Leu His Ser His Leu Glu Arg Asp Pro Ala Leu Arg Leu Thr
                 2035              2040              2045
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gac gcc gcg tac acg ctg atg acg cac cgc acg gcc ttc gcc cac cgc    6192
Asp Ala Ala Tyr Thr Leu Met Thr His Arg Thr Ala Phe Ala His Arg
    2050              2055              2060

gcg gcc gtc cgc gcc gcc gac cac gaa gcc gcg ctg cgc gcc ctg acc    6240
Ala Ala Val Arg Ala Ala Asp His Glu Ala Ala Leu Arg Ala Leu Thr
2065              2070              2075              2080

gcc ctg gct gcg ggc gag gcc gac ccc gcc gtg gac acc ggc acc gcc    6288
Ala Leu Ala Ala Gly Glu Ala Asp Pro Ala Val Asp Thr Gly Thr Ala
              2085              2090              2095

cac acc ggc cgg gac gcc gtc ctc ttc tcc ggc cag gga tcg caa cgc    6336
His Thr Gly Arg Asp Ala Val Leu Phe Ser Gly Gln Gly Ser Gln Arg
              2100              2105              2110

atc gga atg ggc cgg gag ttg tcc ggc cgc tac ccg gtg ttc gca gag    6384
Ile Gly Met Gly Arg Glu Leu Ser Gly Arg Tyr Pro Val Phe Ala Glu
              2115              2120              2125

gcc ttc gac acc gtg tgc gcg gcc ttg gac gag cat ctg gac cgc ccc    6432
Ala Phe Asp Thr Val Cys Ala Ala Leu Asp Glu His Leu Asp Arg Pro
              2130              2135              2140

ctg cgg gac gtg gtc cgg ggc gag gac gag gag ctg ctg aac cgg acc    6480
Leu Arg Asp Val Val Arg Gly Glu Asp Glu Glu Leu Leu Asn Arg Thr
2145              2150              2155              2160

gtc tac gcc cag gcg ggg ctg ttc gcc atc gag gtg gcc ctc ttc cgg    6528
Val Tyr Ala Gln Ala Gly Leu Phe Ala Ile Glu Val Ala Leu Phe Arg
              2165              2170              2175

ctc gtg gag tcc tgg ggc gta cgg ccg cac tac gtg gcc ggg cat tcc    6576
Leu Val Glu Ser Trp Gly Val Arg Pro His Tyr Val Ala Gly His Ser
              2180              2185              2190

gtc ggc gag atc gcc gcc gcg cac gtc gcc ggg gtg ttc tcg ctg gcc    6624
Val Gly Glu Ile Ala Ala Ala His Val Ala Gly Val Phe Ser Leu Ala
              2195              2200              2205

gat gcc tgc gcg ctg gtg gcg gca cgc gga cgg ctg atg cag gcg ctg    6672
Asp Ala Cys Ala Leu Val Ala Ala Arg Gly Arg Leu Met Gln Ala Leu
    2210              2215              2220

ccc gcc ggc ggc gcg atg gcg gcg atc cgg gcg acg gag gac gaa gtc    6720
Pro Ala Gly Gly Ala Met Ala Ala Ile Arg Ala Thr Glu Asp Glu Val
2225              2230              2235              2240

ctc ccg cac ctg gcg gac agc gtc tcg atc gcg gcc gtc aac ggc ccg    6768
Leu Pro His Leu Ala Asp Ser Val Ser Ile Ala Ala Val Asn Gly Pro
              2245              2250              2255

tcg tcg gtc gtc gtc tcc ggc gcc gag cac gcc gtg ctc tcc atc gcc    6816
Ser Ser Val Val Val Ser Gly Ala Glu His Ala Val Leu Ser Ile Ala
              2260              2265              2270

gcg cac ttc gag ggc gcg ggc cgc aag acc acc agg ctg cgg gtc tcg    6864
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Ala His Phe Glu Gly Ala Gly Arg Lys Thr Thr Arg Leu Arg Val Ser
        2275                2280                2285

cac gcc ttc cac tcc ccg ctc atg gac ccg atg ctg gcc gac ttc cgc    6912
His Ala Phe His Ser Pro Leu Met Asp Pro Met Leu Ala Asp Phe Arg
        2290                2295                2300

gcc gtc gcc gag ggc ctg acc tac ggc gag ccg gag ctg gcc gtc gta    6960
Ala Val Ala Glu Gly Leu Thr Tyr Gly Glu Pro Glu Leu Ala Val Val
2305                2310                2315                2320

tcg aac gtc acc ggc caa ctc gcc acc ccg gac cag ctg cgc acc ccc    7008
Ser Asn Val Thr Gly Gln Leu Ala Thr Pro Asp Gln Leu Arg Thr Pro
                2325                2330                2335

gag tac tgg gtg acc cat gtc cgc gcg gcg gtg cgc ttc gcg gac ggg    7056
Glu Tyr Trp Val Thr His Val Arg Ala Ala Val Arg Phe Ala Asp Gly
                2340                2345                2350

ata cgg gct ctg ggg gcg gaa ggg gtg acg cgg ttc ctc gaa ctc ggc    7104
Ile Arg Ala Leu Gly Ala Glu Gly Val Thr Arg Phe Leu Glu Leu Gly
        2355                2360                2365

ccg gac ggc gtc ctg tcg gcc ttg gcc agg gag tcg gca ccg gac gac    7152
Pro Asp Gly Val Leu Ser Ala Leu Ala Arg Glu Ser Ala Pro Asp Asp
        2370                2375                2380

gcc gtg tgc act ccc gtg ctg cgc aag gac cgc tcc gag gcg gcg acc    7200
Ala Val Cys Thr Pro Val Leu Arg Lys Asp Arg Ser Glu Ala Ala Thr
2385                2390                2395                2400

ctc ctc gcg gcc ctg acg cac ctg cac gta cac gga acc gag atc gac    7248
Leu Leu Ala Ala Leu Thr His Leu His Val His Gly Thr Glu Ile Asp
                2405                2410                2415

tgg acc gcg ttc ctc gcc ggc cgc gac gcg cac gcc gtc gac ctg ccc    7296
Trp Thr Ala Phe Leu Ala Gly Arg Asp Ala His Ala Val Asp Leu Pro
                2420                2425                2430

acg tac gcc ttc cag cac cag cgg ttc tgg ccg acc ccc gac cac acc    7344
Thr Tyr Ala Phe Gln His Gln Arg Phe Trp Pro Thr Pro Asp His Thr
        2435                2440                2445

cgc acc ggt gac ctg ggc gcc gtc ggc ctc gaa gcg acc ggg cac ccg    7392
Arg Thr Gly Asp Leu Gly Ala Val Gly Leu Glu Ala Thr Gly His Pro
        2450                2455                2460

ctg ctg agc gcc gcc gtg gaa ctg ccg gac ggt gag ggc ctg ttg ttc    7440
Leu Leu Ser Ala Ala Val Glu Leu Pro Asp Gly Glu Gly Leu Leu Phe
2465                2470                2475                2480

acc acc cgc ctc tcg ctc cag acc cac ccc tgg ctg gcc ggg cac gtc    7488
Thr Thr Arg Leu Ser Leu Gln Thr His Pro Trp Leu Ala Gly His Val
                2485                2490                2495

gtc atg ggc tcg gtc ctg ctg ccg ggg acg gcc ttc gcc gaa ctc gcc    7536
Val Met Gly Ser Val Leu Leu Pro Gly Thr Ala Phe Ala Glu Leu Ala
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ctc cgc gcc gcc gac gag gtg ggc tgc gac cgc gtc gac gaa ctg acc   7584
Leu Arg Ala Ala Asp Glu Val Gly Cys Asp Arg Val Asp Glu Leu Thr
        2515                    2520                    2525

ctg gcc gcc ccg ctc gtc ctg ccc gag cac ggc ggc gta cag ctc cag   7632
Leu Ala Ala Pro Leu Val Leu Pro Glu His Gly Gly Val Gln Leu Gln
        2530                    2535                    2540

ctg cgg gtg ggc ccc gcc gac gcg tcc ggc cgc cgc acc ctg acc gcc   7680
Leu Arg Val Gly Pro Ala Asp Ala Ser Gly Arg Arg Thr Leu Thr Ala
2545                    2550                    2555                    2560

cgc tcc agg gcg gag ggc gac ggc gac cgc ccg tgg gtc cag cac gcc   7728
Arg Ser Arg Ala Glu Gly Asp Gly Asp Arg Pro Trp Val Gln His Ala
                    2565                    2570                    2575

acc ggc gtc ctc gcg gaa ggg gag tcg acg ccc gaa ccc ggc tac gac   7776
Thr Gly Val Leu Ala Glu Gly Glu Ser Thr Pro Glu Pro Gly Tyr Asp
                2580                    2585                    2590

ttc cac acc gag tcc tgg ccg ccc gcc gac gcc gcg ccc gtc gaa ctg   7824
Phe His Thr Glu Ser Trp Pro Pro Ala Asp Ala Ala Pro Val Glu Leu
        2595                    2600                    2605

tcc ggc ctc tac ccg gac ttc gcc gca cac ggt ttc gac tac ggt ccc   7872
Ser Gly Leu Tyr Pro Asp Phe Ala Ala His Gly Phe Asp Tyr Gly Pro
        2610                    2615                    2620

cac ttc cag ggg ctg cgg acc gcc tgg cgc cga ggc gac gag gtg ttc   7920
His Phe Gln Gly Leu Arg Thr Ala Trp Arg Arg Gly Asp Glu Val Phe
2625                    2630                    2635                    2640

gcc gag gtc gcc ctg ccc gcc gag gcc gaa ggc gag gca tcc gcg tac   7968
Ala Glu Val Ala Leu Pro Ala Glu Ala Glu Gly Glu Ala Ser Ala Tyr
                    2645                    2650                    2655

gga ctc cat ccg gcg ctg ctc gac gcc gcc ctg cac gtc gtc gcg ttc   8016
Gly Leu His Pro Ala Leu Leu Asp Ala Ala Leu His Val Val Ala Phe
                2660                    2665                    2670

aac gga gtg gac cgc ggc gtc gtg ccg ttc tcc tgg gag agc gtc gcg   8064
Asn Gly Val Asp Arg Gly Val Val Pro Phe Ser Trp Glu Ser Val Ala
                2675                    2680                    2685

ctg cac gcc acc ggc gcc tcg gcc gta cgg atc cgg gtc gtc cgg cac   8112
Leu His Ala Thr Gly Ala Ser Ala Val Arg Ile Arg Val Val Arg His
        2690                    2695                    2700

agc ggc gac acg gtc tcc gtg gat gtc gcc gac acc acc ggc gag ccc   8160
Ser Gly Asp Thr Val Ser Val Asp Val Ala Asp Thr Thr Gly Glu Pro
2705                    2710                    2715                    2720

gtc gcc tcc atc ggc acg ctc gtc ctg cgg gcg gtc tcc gcc gac cag   8208
Val Ala Ser Ile Gly Thr Leu Val Leu Arg Ala Val Ser Ala Asp Gln
                    2725                    2730                    2735
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ttg gcg ggc ggc gcg gac ccg gcc gtc cgc gat gcg ctg ttc cgc gtg    8256
Leu Ala Gly Gly Ala Asp Pro Ala Val Arg Asp Ala Leu Phe Arg Val
            2740                2745                2750

cag tgg aac ccc gta cgc ctg ccc ccg gcc ggg gcc gcg gtg acc gtg    8304
Gln Trp Asn Pro Val Arg Leu Pro Pro Ala Gly Ala Ala Val Thr Val
            2755                2760                2765

gcg acg ctc ggc tcc ctt gcc ggc gca ccg ttc gac ggc tac ccg gac    8352
Ala Thr Leu Gly Ser Leu Ala Gly Ala Pro Phe Asp Gly Tyr Pro Asp
            2770                2775                2780

ctg gcg tcc ctg gcc cgg tcc ggt cgt gtg gcg ggt gcg gtg ctg gta    8400
Leu Ala Ser Leu Ala Arg Ser Gly Arg Val Ala Gly Ala Val Leu Val
2785                2790                2795                2800

ccg gtg gaa gcc ggt gcc ggc gag gtg gtg gcg gac gat gtc gtg ggg    8448
Pro Val Glu Ala Gly Ala Gly Glu Val Val Ala Asp Asp Val Val Gly
            2805                2810                2815

gcg acg cac gca acg gcc gcc cgg gcg ctg gac ctg gcc cgg tcg tgg    8496
Ala Thr His Ala Thr Ala Ala Arg Ala Leu Asp Leu Ala Arg Ser Trp
            2820                2825                2830

ctg gcc gat gac cgg ttc gcg gcc tcg cgc ctg gtg ttc gtg acg cgt    8544
Leu Ala Asp Asp Arg Phe Ala Ala Ser Arg Leu Val Phe Val Thr Arg
            2835                2840                2845

ggc gcg gtg tcc ggt gcg gat ctc gcg ggt gcg gcg gtg tgg ggt ctg    8592
Gly Ala Val Ser Gly Ala Asp Leu Ala Gly Ala Ala Val Trp Gly Leu
            2850                2855                2860

gtg cgg tcg gcg ctg tcg gag cac ccg ggc cgc ttc ggt ctg gtg gat    8640
Val Arg Ser Ala Leu Ser Glu His Pro Gly Arg Phe Gly Leu Val Asp
2865                2870                2875                2880

ctg gat gac gat gcc gaa ctg gcg ctg gtg cca cgg gtg ttg gcg tcg    8688
Leu Asp Asp Asp Ala Glu Leu Ala Leu Val Pro Arg Val Leu Ala Ser
            2885                2890                2895

gat gag ccg cag ctg ctg gtg cgc ggt ggt gag gtg ctg gcg gcg cgg    8736
Asp Glu Pro Gln Leu Leu Val Arg Gly Gly Glu Val Leu Ala Ala Arg
            2900                2905                2910

ctg gcc cgg gcg cag tcc tcg cac gcg gtg acc tgg gat ccg tcc ggc    8784
Leu Ala Arg Ala Gln Ser Ser His Ala Val Thr Trp Asp Pro Ser Gly
            2915                2920                2925

acg gtg ctc gtc acc ggt ggc acg ggt ggt ctg ggc cgt gtg atg gca    8832
Thr Val Leu Val Thr Gly Gly Thr Gly Gly Leu Gly Arg Val Met Ala
            2930                2935                2940

cgt cac ttg gtg gtg gaa cac ggg gta cgg aac ctg ctg ctg gtc agc    8880
Arg His Leu Val Val Glu His Gly Val Arg Asn Leu Leu Leu Val Ser
2945                2950                2955                2960
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cgc cgt ggg ccc gcc gcc gaa ggt gcc gaa gag ctg gtg acg gag ctc    8928
Arg Arg Gly Pro Ala Ala Glu Gly Ala Glu Glu Leu Val Thr Glu Leu
            2965                2970                2975

cgg cac agc ggt gcc gaa gtg gcc gtc gaa gcc tgt gat gtc acc gac    8976
Arg His Ser Gly Ala Glu Val Ala Val Glu Ala Cys Asp Val Thr Asp
            2980                2985                2990

gcg gcc gcc gtg gcc gac ctg gtg gcc cgg cac cgg atc agc gct gtg    9024
Ala Ala Ala Val Ala Asp Leu Val Ala Arg His Arg Ile Ser Ala Val
            2995                3000                3005

gtg cat acg gcc ggt gtc ctg gat gac ggt gtg gtg gag tcg ctg aca    9072
Val His Thr Ala Gly Val Leu Asp Asp Gly Val Val Glu Ser Leu Thr
            3010                3015                3020

ccg gag cgg ctg tcg gcg gtg ttg cgt ccg aag gtg gat gcg gcc tgg    9120
Pro Glu Arg Leu Ser Ala Val Leu Arg Pro Lys Val Asp Ala Ala Trp
3025                3030                3035                3040

aac ctg cac gag gcg acc agg gat ctg gac ctg gac gcg ttc gtg gtc    9168
Asn Leu His Glu Ala Thr Arg Asp Leu Asp Leu Asp Ala Phe Val Val
            3045                3050                3055

ttc tcc tca gtg gca ggc acg atc ggg agc ccc ggt cag gcc aac tac    9216
Phe Ser Ser Val Ala Gly Thr Ile Gly Ser Pro Gly Gln Ala Asn Tyr
            3060                3065                3070

gcg gcg ggc aac gcc ttc ctg gat gcc ctg gcc cac cac cgt cgg gcg    9264
Ala Ala Gly Asn Ala Phe Leu Asp Ala Leu Ala His His Arg Arg Ala
            3075                3080                3085

gcg ggt ctt ccg gcg gcg tcg ctg gca tgg ggc ccc tgg tcc cgg gac    9312
Ala Gly Leu Pro Ala Ala Ser Leu Ala Trp Gly Pro Trp Ser Arg Asp
            3090                3095                3100

ggc ggc atg acc ggc acc ctg acc gac gtc gac tcc agc gca tcg ccc    9360
Gly Gly Met Thr Gly Thr Leu Thr Asp Val Asp Ser Ser Ala Ser Pro
3105                3110                3115                3120

ggc agg cat gcc cga act cac ccc cgc aca ggg cgt ggc ctc ttc gac    9408
Gly Arg His Ala Arg Thr His Pro Arg Thr Gly Arg Gly Leu Phe Asp
            3125                3130                3135

gcc gcg ctg gcg gcc ggt gac gcc cac ctg ctc ccc gta cgc ttc gac    9456
Ala Ala Leu Ala Ala Gly Asp Ala His Leu Leu Pro Val Arg Phe Asp
            3140                3145                3150

tgg gcg tcc ctg cgc gcc cag ggc gag gtg cca ccg ctg ttg cgc ggc    9504
Trp Ala Ser Leu Arg Ala Gln Gly Glu Val Pro Pro Leu Leu Arg Gly
            3155                3160                3165

ctg atc agg acc cgt gcc cgg cgc tcg gcg gtc ggc ggc tcg gcc gcg    9552
Leu Ile Arg Thr Arg Ala Arg Arg Ser Ala Val Gly Gly Ser Ala Ala
            3170                3175                3180

gca gcc ggc ctg gtg gga cgc ctg agc gga cgg gga acg gtg gag cgg    9600
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Ala Ala Gly Leu Val Gly Arg Leu Ser Gly Arg Gly Thr Val Glu Arg
3185                3190                3195                3200

cgc gag gtg ctc ctg gac ctg gta cgg gcc cag atc gcg gtc gtc ctg     9648
Arg Glu Val Leu Leu Asp Leu Val Arg Ala Gln Ile Ala Val Val Leu
                3205                3210                3215

ggc cac gcg aac ccg gag acg atc gag tcc acc cgt gtc ttc cag gac     9696
Gly His Ala Asn Pro Glu Thr Ile Glu Ser Thr Arg Val Phe Gln Asp
                3220                3225                3230

ctc ggc ttc gac tcc ctg acc gcg gtc gaa ctc cgc aac cgc ctc aac     9744
Leu Gly Phe Asp Ser Leu Thr Ala Val Glu Leu Arg Asn Arg Leu Asn
                3235                3240                3245

aac gcg acc ggc ctg cgc ctt tcg gcc acc gcc gtc ttc gac tac ccc     9792
Asn Ala Thr Gly Leu Arg Leu Ser Ala Thr Ala Val Phe Asp Tyr Pro
                3250                3255                3260

acg gcg gac gcg ctc gtc gac ttc ctg ctg gac gag ctg ttc ggc gcg     9840
Thr Ala Asp Ala Leu Val Asp Phe Leu Leu Asp Glu Leu Phe Gly Ala
3265                3270                3275                3280

cag gag gag gcc gag ctg ccg gcg ccg gtg ccg tca ccg gcg ggg gcc     9888
Gln Glu Glu Ala Glu Leu Pro Ala Pro Val Pro Ser Pro Ala Gly Ala
                3285                3290                3295

gcc gac gac ccg gtc gtg atc gtc ggc atg agc tgc cgc tac ccg ggc     9936
Ala Asp Asp Pro Val Val Ile Val Gly Met Ser Cys Arg Tyr Pro Gly
                3300                3305                3310

ggc gtc ggc tcg ccc gag gac ctg tgg cgc ctg gtg tcg gag ggc gtg     9984
Gly Val Gly Ser Pro Glu Asp Leu Trp Arg Leu Val Ser Glu Gly Val
                3315                3320                3325

gac gcg gtg tcc gac ttc ccc acc gac cgt gga tgg gac gtg gag agc     10032
Asp Ala Val Ser Asp Phe Pro Thr Asp Arg Gly Trp Asp Val Glu Ser
                3330                3335                3340

ctc tac agc ccc gac ccc gag gcg ctc ggc acc tcg tac acc cgc tcc     10080
Leu Tyr Ser Pro Asp Pro Glu Ala Leu Gly Thr Ser Tyr Thr Arg Ser
3345                3350                3355                3360

ggt gga ttc ctc cac gag gcg gcg gag ttc gac ccc gat ttc ttc ggg     10128
Gly Gly Phe Leu His Glu Ala Ala Glu Phe Asp Pro Asp Phe Phe Gly
                3365                3370                3375

atg agc ccg cgc gag gcg ctg gcg acc gac gcc cag cag cgg ctg ctg     10176
Met Ser Pro Arg Glu Ala Leu Ala Thr Asp Ala Gln Gln Arg Leu Leu
                3380                3385                3390

ctg gag acg acc tgg gag gcc atc gag cgc acg ggc atc gac ccg gcg     10224
Leu Glu Thr Thr Trp Glu Ala Ile Glu Arg Thr Gly Ile Asp Pro Ala
                3395                3400                3405

tcg ctg cgg ggc agc cgt acg ggc gtc ttc gcg ggc gtg atg tac acc     10272
Ser Leu Arg Gly Ser Arg Thr Gly Val Phe Ala Gly Val Met Tyr Thr
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gac tac ggc gac ctc ctc gtc ggc gac cag ttc gag ggc tac cgc agc   10320
Asp Tyr Gly Asp Leu Leu Val Gly Asp Gln Phe Glu Gly Tyr Arg Ser
3425   3430   3435   3440

aac ggc agc gcg gcc agc atc gcc tcc ggc cgg gtc tcg tac acc ttc   10368
Asn Gly Ser Ala Ala Ser Ile Ala Ser Gly Arg Val Ser Tyr Thr Phe
                    3445   3450   3455

ggt ttc gag ggt ccg gcg gtc acg gtg gac acg gca tgc tcg tcg tcc   10416
Gly Phe Glu Gly Pro Ala Val Thr Val Asp Thr Ala Cys Ser Ser Ser
                    3460   3465   3470

ctg gtc gcc ctg cac tgg gcg gcg cag tcg ctg cgc tcg ggc gag tgc   10464
Leu Val Ala Leu His Trp Ala Ala Gln Ser Leu Arg Ser Gly Glu Cys
                    3475   3480   3485

tcg ctc gcg gtc gcg ggc ggt gtg acg gtg atg tcc aca ccg acg acg   10512
Ser Leu Ala Val Ala Gly Gly Val Thr Val Met Ser Thr Pro Thr Thr
                    3490   3495   3500

ttc gtc gag ttc tcg cgg caa cgc gga ctg tcg gcg gac ggc cgc tgc   10560
Phe Val Glu Phe Ser Arg Gln Arg Gly Leu Ser Ala Asp Gly Arg Cys
3505   3510   3515   3520

aag gcg ttc gcc gat gcg gcc gac ggc gtc ggc tgg ggc gag ggc gtc   10608
Lys Ala Phe Ala Asp Ala Ala Asp Gly Val Gly Trp Gly Glu Gly Val
                    3525   3530   3535

ggc atg ctc gta ctg gag cgt ctg tcg gac gcg cgc cgc aac ggg cac   10656
Gly Met Leu Val Leu Glu Arg Leu Ser Asp Ala Arg Arg Asn Gly His
                    3540   3545   3550

cgg gtg ctc gcg gtg gtg cgc ggc agt gcg gtg aac cag gac ggt gcg   10704
Arg Val Leu Ala Val Val Arg Gly Ser Ala Val Asn Gln Asp Gly Ala
                    3555   3560   3565

tcc aat ggt ctg acg gcg ccg aac ggc ccc gcc cag cag cgg gtg atc   10752
Ser Asn Gly Leu Thr Ala Pro Asn Gly Pro Ala Gln Gln Arg Val Ile
                    3570   3575   3580

cgg cag gcg ctg gcg agt gcg ggg ctg tcg gcg gcg gat gtg gac gcg   10800
Arg Gln Ala Leu Ala Ser Ala Gly Leu Ser Ala Ala Asp Val Asp Ala
3585   3590   3595   3600

gtg gag gcg cac ggt acg ggt acg acg ctg ggc gat ccg atc gag gcc   10848
Val Glu Ala His Gly Thr Gly Thr Thr Leu Gly Asp Pro Ile Glu Ala
                    3605   3610   3615

cag gcg ctg ctc gcc acg tat ggc cag gag cga cct gag gac cgg ccg   10896
Gln Ala Leu Leu Ala Thr Tyr Gly Gln Glu Arg Pro Glu Asp Arg Pro
                    3620   3625   3630

ttg ctg ctg ggg tcg gtc aaa tcc aac atc ggt cat gcg cag gcg gct   10944
Leu Leu Leu Gly Ser Val Lys Ser Asn Ile Gly His Ala Gln Ala Ala
                    3635   3640   3645

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tcg ggt gtg gcg ggt gtc atc aag atg gtg ctg gcg atg cgg cac ggt   10992
Ser Gly Val Ala Gly Val Ile Lys Met Val Leu Ala Met Arg His Gly
    3650                3655                3660

gtg ctg cct cgg acg ctg cat gtg gat gaa ccg tcg tcg cat gtc gac   11040
Val Leu Pro Arg Thr Leu His Val Asp Glu Pro Ser Ser His Val Asp
3665                3670                3675                3680

tgg agt gcc ggt gcc gtc gag ctg ctg acc tcc gag gcc gag tgg ccg   11088
Trp Ser Ala Gly Ala Val Glu Leu Leu Thr Ser Glu Ala Glu Trp Pro
                3685                3690                3695

cag ggc gag ggg ccg cgc cgc gcg ggc gtc tcc tcc ttc ggc gtc agc   11136
Gln Gly Glu Gly Pro Arg Arg Ala Gly Val Ser Ser Phe Gly Val Ser
            3700                3705                3710

ggg acg aac gcg cat gtg atc ctg gag cag ccc gga ccg gac gcg gcc   11184
Gly Thr Asn Ala His Val Ile Leu Glu Gln Pro Gly Pro Asp Ala Ala
            3715                3720                3725

gac gcc gca ccg gac gcc acg gtg acc gat ccc ggc gcg ctg gca tgg   11232
Asp Ala Ala Pro Asp Ala Thr Val Thr Asp Pro Gly Ala Leu Ala Trp
    3730                3735                3740

gtg ctc tcc gca cgg aac gaa gcg gcc ctg cgc tgc cag gcg gcg cgc   11280
Val Leu Ser Ala Arg Asn Glu Ala Ala Leu Arg Cys Gln Ala Ala Arg
3745                3750                3755                3760

ctg ctg tcc ctg gtc gcc ggc agt gac gcg ctg tgc gcg cgg gac atc   11328
Leu Leu Ser Leu Val Ala Gly Ser Asp Ala Leu Cys Ala Arg Asp Ile
            3765                3770                3775

ggc cac tcg ctg gtg acc ggg cgg tcg agc ttc gcc cac cgt gcg gtg   11376
Gly His Ser Leu Val Thr Gly Arg Ser Ser Phe Ala His Arg Ala Val
            3780                3785                3790

gtg tgg ggc cag gac cgc gac gca ctg gtg cgt gcc ctg tcc gca ctc   11424
Val Trp Gly Gln Asp Arg Asp Ala Leu Val Arg Ala Leu Ser Ala Leu
            3795                3800                3805

gcg gtg ggc gag gcc gac gcc ggt ctg gcg gag ggc gcg tcc ggc gcg   11472
Ala Val Gly Glu Ala Asp Ala Gly Leu Ala Glu Gly Ala Ser Gly Ala
    3810                3815                3820

ggg agg acg gcc ttc ctg ttc tcg ggc cag gga tca caa cgg ctg gga   11520
Gly Arg Thr Ala Phe Leu Phe Ser Gly Gln Gly Ser Gln Arg Leu Gly
3825                3830                3835                3840

atg gga tgg gag ttg tac gct cgc tac ccg gtg ttc gcg gac gca ttc   11568
Met Gly Trp Glu Leu Tyr Ala Arg Tyr Pro Val Phe Ala Asp Ala Phe
            3845                3850                3855

gac gcc gtg tgc gcg gcc ttg gac gag cac ctg gag cgc ccc ctg cgg   11616
Asp Ala Val Cys Ala Ala Leu Asp Glu His Leu Glu Arg Pro Leu Arg
            3860                3865                3870
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gac gtg gtc tgg ggc gag gac gcg gag ctg ctg aac cag acc gcg tac    11664
Asp Val Val Trp Gly Glu Asp Ala Glu Leu Leu Asn Gln Thr Ala Tyr
        3875                3880                3885

gcc cag gcc ggg ctg ttc gcg atc gag. gtg gcg ctg tac cgg ctg gcg    11712
Ala Gln Ala Gly Leu Phe Ala Ile Glu Val Ala Leu Tyr Arg Leu Ala
        3890                3895                3900

gaa tcg tgg ggc atg cgc ccg gac ttc gtg gcg ggg cat tcg atc ggt    11760
Glu Ser Trp Gly Met Arg Pro Asp Phe Val Ala Gly His Ser Ile Gly
3905                3910                3915                3920

gag gtc gcc gcg gcc cat gtg tcg ggt gtc ttc tcg ctc ccg gat gcc    11808
Glu Val Ala Ala Ala His Val Ser Gly Val Phe Ser Leu Pro Asp Ala
                3925                3930                3935

tgt gcg ctg gtg gcg gcc cga ggc cga ctg atg cag caa ctg ccc tcc    11856
Cys Ala Leu Val Ala Ala Arg Gly Arg Leu Met Gln Gln Leu Pro Ser
            3940                3945                3950

ggc ggc gcg atg atg gcg atc cgg gcg acc gag gac gag gtc ctt ccg    11904
Gly Gly Ala Met Met Ala Ile Arg Ala Thr Glu Asp Glu Val Leu Pro
        3955                3960                3965

cat ctg gcg gaa ggc gtc tcg ctc gcg gcg gtc aat ggc ccg tcg tcg    11952
His Leu Ala Glu Gly Val Ser Leu Ala Ala Val Asn Gly Pro Ser Ser
        3970                3975                3980

gtc gtg atc tcg ggc gcc gag gac gcg gtg ctg gcc atc gcg gcg cac    12000
Val Val Ile Ser Gly Ala Glu Asp Ala Val Leu Ala Ile Ala Ala His
3985                3990                3995                4000

ttc gcg ggg gag ggg cgc aaa acc acc cga ctg cgg gtc tcg cat gcc    12048
Phe Ala Gly Glu Gly Arg Lys Thr Thr Arg Leu Arg Val Ser His Ala
                4005                4010                4015

ttc cac tcg ccg ctc atg gaa ccg atg ctg gag gaa ttc cgc gcg gtg    12096
Phe His Ser Pro Leu Met Glu Pro Met Leu Glu Glu Phe Arg Ala Val
                4020                4025                4030

gtg aca cgg ctg tcc ttc ggc acg ccg acg atc ccc gtc gtc tcc aac    12144
Val Thr Arg Leu Ser Phe Gly Thr Pro Thr Ile Pro Val Val Ser Asn
        4035                4040                4045

ctg acg ggc cgc ctc gcc gaa ccc gaa cag ctc gcg cac gcc gac tac    12192
Leu Thr Gly Arg Leu Ala Glu Pro Glu Gln Leu Ala His Ala Asp Tyr
        4050                4055                4060

tgg gtc cgg cac gtc cgc gag gca gtg cgc ttc gcg gac ggg ata cag    12240
Trp Val Arg His Val Arg Glu Ala Val Arg Phe Ala Asp Gly Ile Gln
4065                4070                4075                4080

gcg ctg cgg gcg gaa ggg gtg acg cgg ttc ctg gag ctc ggc ccg gac    12288
Ala Leu Arg Ala Glu Gly Val Thr Arg Phe Leu Glu Leu Gly Pro Asp
                4085                4090                4095

ggt gtg ctg tcg gcg atg gcc cgc gag tcg gca tcg gac gac gcc gtg    12336
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Gly Val Leu Ser Ala Met Ala Arg Glu Ser Ala Ser Asp Asp Ala Val
          4100                4105                4110

ctc gcg ccc gta ctg cgc agg gac cgg ccc gag gag acg gcg ctg ctg      12384
Leu Ala Pro Val Leu Arg Arg Asp Arg Pro Glu Glu Thr Ala Leu Leu
          4115                4120                4125

ggc gcc ctg gcg cag ctg tac gtc cgg ggt gcg cac gtg gac tgg acg      12432
Gly Ala Leu Ala Gln Leu Tyr Val Arg Gly Ala His Val Asp Trp Thr
          4130                4135                4140

gtg ccg ttc gcc ggt tcg ggt gcg cgc tgg gcg gat ctg ccg acg tac      12480
Val Pro Phe Ala Gly Ser Gly Ala Arg Trp Ala Asp Leu Pro Thr Tyr
4145                4150                4155                4160

gcg ttc cag cac gag cgg ttc tgg ccg tcg ggc ggt gtg gca cgt ccg      12528
Ala Phe Gln His Glu Arg Phe Trp Pro Ser Gly Gly Val Ala Arg Pro
          4165                4170                4175

ggc gat gtg cgg tcc gcg ggc ctg ggc tcg gcc ggg cat ccg ctg ctg      12576
Gly Asp Val Arg Ser Ala Gly Leu Gly Ser Ala Gly His Pro Leu Leu
          4180                4185                4190

ggc gcg gcg gtg gaa ctg gcg ggc tcg ggc ggc ctg ttg ttc acg ggc      12624
Gly Ala Ala Val Glu Leu Ala Gly Ser Gly Gly Leu Leu Phe Thr Gly
          4195                4200                4205

cgg ctg tcg gtg tcc tcg cac ccg tgg ctg gcg gac cat gtg gtg ctg      12672
Arg Leu Ser Val Ser Ser His Pro Trp Leu Ala Asp His Val Val Leu
          4210                4215                4220

ggc tcc gtc ctc gtg ccc ggc acc gcg ctg gtg gaa ctg gtg ctg cgg      12720
Gly Ser Val Leu Val Pro Gly Thr Ala Leu Val Glu Leu Val Leu Arg
4225                4230                4235                4240

gcg gcc gac gag gcc ggc tgt gac ctc ctg gag gag ctg acg ctc gcc      12768
Ala Ala Asp Glu Ala Gly Cys Asp Leu Leu Glu Glu Leu Thr Leu Ala
               4245                4250                4255

gca ccg ctg gtg ctg ccc gcc tcg ggc gcc gcg gtc cag gtt cag gta      12816
Ala Pro Leu Val Leu Pro Ala Ser Gly Ala Ala Val Gln Val Gln Val
          4260                4265                4270

gcg gtg ggc gag ccc gat gag gcg ggc cgc cgg ccg gtc tcg gtc cat      12864
Ala Val Gly Glu Pro Asp Glu Ala Gly Arg Arg Pro Val Ser Val His
          4275                4280                4285

gca cgt gag ggc gag ggc cca tgg acg ctg cac gcc agt ggt gcg gtg      12912
Ala Arg Glu Gly Glu Gly Pro Trp Thr Leu His Ala Ser Gly Ala Val
          4290                4295                4300

acc tcg ggc gcc gaa gtg ccc ccc ttc gac gcc acc gta tgg ccg ccc      12960
Thr Ser Gly Ala Glu Val Pro Pro Phe Asp Ala Thr Val Trp Pro Pro
4305                4310                4315                4320

aag ggc gcg gag ccc gtg gac gtg gcg gac tgc tac gac gta ctc gcc      13008
Lys Gly Ala Glu Pro Val Asp Val Ala Asp Cys Tyr Asp Val Leu Ala
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                4325                    4330                    4335

gat gcc ggg ctc acc tac ggc ccg gcc ttc cac ggc ctg caa gcg gcc    13056
Asp Ala Gly Leu Thr Tyr Gly Pro Ala Phe His Gly Leu Gln Ala Ala
        4340                    4345                    4350

tgg aag ctc ggt ggg gac gtc tac gcc gag gcg aag ctc ccc gag agc    13104
Trp Lys Leu Gly Gly Asp Val Tyr Ala Glu Ala Lys Leu Pro Glu Ser
        4355                    4360                    4365

acc gac ggc gac gca tac ggt ctg cac ccc gcg ctc ttc gac gcc gcg    13152
Thr Asp Gly Asp Ala Tyr Gly Leu His Pro Ala Leu Phe Asp Ala Ala
        4370                    4375                    4380

ctg cac gcg tcg gcg ctg ggc ggc gcg gaa gcg ggc gga gtc ccg ttc    13200
Leu His Ala Ser Ala Leu Gly Gly Ala Glu Ala Gly Gly Val Pro Phe
4385                    4390                    4395                    4400

tcc tgg gcc gga gtg tcg ctg cac gcg acc ggc gcc tcg cac ctc cgc    13248
Ser Trp Ala Gly Val Ser Leu His Ala Thr Gly Ala Ser His Leu Arg
                4405                    4410                    4415

gtc cgc atc cgc gaa gcg ggc ggc gcg ctg tcg gtc gcg atc gcg gac    13296
Val Arg Ile Arg Glu Ala Gly Gly Ala Leu Ser Val Ala Ile Ala Asp
                4420                    4425                    4430

acg tcc ggc gcg ccg gtc gcc tcg gtg gag tcg ctg gtg ata cgt ccg    13344
Thr Ser Gly Ala Pro Val Ala Ser Val Glu Ser Leu Val Ile Arg Pro
        4435                    4440                    4445

ctc tcg gcc ggg cag gtg cag gcc gcc gac cgt gac gcc ctc ttc aag    13392
Leu Ser Ala Gly Gln Val Gln Ala Ala Asp Arg Asp Ala Leu Phe Lys
        4450                    4455                    4460

gcc gac tgg gtc ccc gta ccg ctc acg gac gaa cgc gtc gag ccg ggc    13440
Ala Asp Trp Val Pro Val Pro Leu Thr Asp Glu Arg Val Glu Pro Gly
4465                    4470                    4475                    4480

acc ggc ccg gag ggc gag ccg ctg cgg acg tac gcg gat ctg gat tcc    13488
Thr Gly Pro Glu Gly Glu Pro Leu Arg Thr Tyr Ala Asp Leu Asp Ser
                4485                    4490                    4495

ctg gag ggc gcg gcc gtg ccc ggg acg gtc ctg gtc gcg ccg cct tcc    13536
Leu Glu Gly Ala Ala Val Pro Gly Thr Val Leu Val Ala Pro Pro Ser
                4500                    4505                    4510

ggc gct gcc ggg acg gtg gag tcc gta cac gcc gcg acc gtc tgg gcg    13584
Gly Ala Ala Gly Thr Val Glu Ser Val His Ala Ala Thr Val Trp Ala
                4515                    4520                    4525

ctg gag atg gtg cag gcg tgg ctg gcc gac gac cgg ttc gcc acc tcg    13632
Leu Glu Met Val Gln Ala Trp Leu Ala Asp Asp Arg Phe Ala Thr Ser
        4530                    4535                    4540

cga ctg gtg ttc gtc acc cgc ggc gcg gcc ttc ggc gcg gat ctt gcg    13680
Arg Leu Val Phe Val Thr Arg Gly Ala Ala Phe Gly Ala Asp Leu Ala
4545                    4550                    4555                    4560
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gcg gcc gcc gtc cgg ggc ctg gtg cgc tcg gca cag tcg gag aac ccg    13728
Ala Ala Ala Val Arg Gly Leu Val Arg Ser Ala Gln Ser Glu Asn Pro
            4565                4570                4575

ggc cgc ttc ggc ctg gtg gac atg gac ggc gac gcc gat acg acc gta    13776
Gly Arg Phe Gly Leu Val Asp Met Asp Gly Asp Ala Asp Thr Thr Val
            4580                4585                4590

ccg gcg caa gcg ctc gcg acc gac gag ccc gaa ctg ctg gtg cgt ggt    13824
Pro Ala Gln Ala Leu Ala Thr Asp Glu Pro Glu Leu Leu Val Arg Gly
            4595                4600                4605

ggt gag gtg ctg gcg gcc cgg ctg gtc cgg gcg cag tcc tcg cac acg    13872
Gly Glu Val Leu Ala Ala Arg Leu Val Arg Ala Gln Ser Ser His Thr
        4610                4615                4620

gtg acg tgg gat ccg tcc ggt acg gtc ctg atc acc ggc ggg acc ggt    13920
Val Thr Trp Asp Pro Ser Gly Thr Val Leu Ile Thr Gly Gly Thr Gly
4625                4630                4635                4640

ggg ctg ggc cgt agt gtc gcc cgg cac ttg gtg agc gag cac ggg gtg    13968
Gly Leu Gly Arg Ser Val Ala Arg His Leu Val Ser Glu His Gly Val
            4645                4650                4655

cgc agt ctg ctg ctg gtc agc cgc cgt ggt ccc gcg gcc gag ggt gcc    14016
Arg Ser Leu Leu Leu Val Ser Arg Arg Gly Pro Ala Ala Glu Gly Ala
            4660                4665                4670

ggg gag ttg gtg gcc gaa ctc agg ggc agt ggc gcc gag gtg gtc atc    14064
Gly Glu Leu Val Ala Glu Leu Arg Gly Ser Gly Ala Glu Val Val Ile
        4675                4680                4685

gag gct tgt gat gtg acc gat gcg gtg gcg gtg gcc gat ctg gtg gct    14112
Glu Ala Cys Asp Val Thr Asp Ala Val Ala Val Ala Asp Leu Val Ala
        4690                4695                4700

cgg cat cgg atc agt gct gtg gtg cat acg gcc ggt gtt ctg gat gac    14160
Arg His Arg Ile Ser Ala Val Val His Thr Ala Gly Val Leu Asp Asp
4705                4710                4715                4720

ggt gtg gtg gag tcg ctg acg ccg gag cgg ctt gcg gtg gtg ttg cgt    14208
Gly Val Val Glu Ser Leu Thr Pro Glu Arg Leu Ala Val Val Leu Arg
            4725                4730                4735

ccg aag gtg gat gcg gcc tgg aac ctg cac gag gcg acc agg ggt ctg    14256
Pro Lys Val Asp Ala Ala Trp Asn Leu His Glu Ala Thr Arg Gly Leu
            4740                4745                4750

gat ctg gat gcg ttt gtg gtg ttc tcg tcc gtg gca ggc act ttc ggc    14304
Asp Leu Asp Ala Phe Val Val Phe Ser Ser Val Ala Gly Thr Phe Gly
            4755                4760                4765

agt gcg ggt cag gcc aat tac gcg gcg ggt aat gct ttc ctg gac gcg    14352
Ser Ala Gly Gln Ala Asn Tyr Ala Ala Gly Asn Ala Phe Leu Asp Ala
            4770                4775                4780
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ctg gcg tat cac cgt cgg gcg gtg ggt ctg ccg gcg gtg tcg ctg gcg    14400
Leu Ala Tyr His Arg Arg Ala Val Gly Leu Pro Ala Val Ser Leu Ala
4785                4790            4795                4800

tgg ggc cct tgg tcg cag gac ggt ggt atg acc ggc acc ttg agc gac    14448
Trp Gly Pro Trp Ser Gln Asp Gly Gly Met Thr Gly Thr Leu Ser Asp
                    4805            4810            4815

gcc gat gtc cag cgc atc gcc cgg cag ggc atg ccg ccg ctg acc gtc    14496
Ala Asp Val Gln Arg Ile Ala Arg Gln Gly Met Pro Pro Leu Thr Val
            4820            4825            4830

gag gag ggt ctg gcc ctc ttc gac gcc gcg ctc ggc agc gcc gaa ccc    14544
Glu Glu Gly Leu Ala Leu Phe Asp Ala Ala Leu Gly Ser Ala Glu Pro
        4835            4840            4845

atg gca ctc ccg gtc cgc ctg gac ctg gcg gcg ctg cgg gca caa ggc    14592
Met Ala Leu Pro Val Arg Leu Asp Leu Ala Ala Leu Arg Ala Gln Gly
        4850            4855            4860

gag ccc cag cca ctg ctg cgc ggc ctc atc cgg acg agg acc cgc cgg    14640
Glu Pro Gln Pro Leu Leu Arg Gly Leu Ile Arg Thr Arg Thr Arg Arg
4865            4870            4875            4880

tcc ggc gcc gcc gcg gca tcc ggc atc gcg cag cgc ctt gcc ggg ctg    14688
Ser Gly Ala Ala Ala Ala Ser Gly Ile Ala Gln Arg Leu Ala Gly Leu
                4885            4890            4895

tcc acg gcg gag cgg cgc gag gcg ctg ctc gat gtc gta cgg gcc cag    14736
Ser Thr Ala Glu Arg Arg Glu Ala Leu Leu Asp Val Val Arg Ala Gln
            4900            4905            4910

atc gcg acg gtc ctg ggc cac gcc ggc ccg gaa acg atc gcc cct gac    14784
Ile Ala Thr Val Leu Gly His Ala Gly Pro Glu Thr Ile Ala Pro Asp
            4915            4920            4925

cgg gcc ttc cag gac ctc ggc ctc gac tcc ctg acg gcg atc gaa ctc    14832
Arg Ala Phe Gln Asp Leu Gly Leu Asp Ser Leu Thr Ala Ile Glu Leu
        4930            4935            4940

cgt aac ctg ctc ggc aag gcc acc ggg ctg cgg ctc ccg gca acg acc    14880
Arg Asn Leu Leu Gly Lys Ala Thr Gly Leu Arg Leu Pro Ala Thr Thr
4945            4950            4955            4960

gtg ttc gac tac ccg acg gtg gat gcc ctg gcc gcc cac ctc ttg gac    14928
Val Phe Asp Tyr Pro Thr Val Asp Ala Leu Ala Ala His Leu Leu Asp
                4965            4970            4975

gaa ctg ttc ggc gcg gag acg ggg acc gcg acg gag acg ccc ctc ccg    14976
Glu Leu Phe Gly Ala Glu Thr Gly Thr Ala Thr Glu Thr Pro Leu Pro
            4980            4985            4990

gtg ccc ggc ctg ccg tcc ctg gcg gac gat ccg gtc gtg atc gtc ggc    15024
Val Pro Gly Leu Pro Ser Leu Ala Asp Asp Pro Val Val Ile Val Gly
            4995            5000            5005

atg agc tgc cgc ttc ccc ggc ggc gtc gcc tcg ccg gag gac ctg tgg    15072
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Met Ser Cys Arg Phe Pro Gly Gly Val Ala Ser Pro Glu Asp Leu Trp
    5010              5015              5020


cgc ctg gtg gcg gac ggc gtg gac gcc gtc tcc gcc ttc ccg acc gac    15120
Arg Leu Val Ala Asp Gly Val Asp Ala Val Ser Ala Phe Pro Thr Asp
5025              5030              5035              5040


cgg ggc tgg gag atc gac gac acc tac gac ccc gag cgg gag ggc gcc    15168
Arg Gly Trp Glu Ile Asp Asp Thr Tyr Asp Pro Glu Arg Glu Gly Ala
              5045              5050              5055


atc gcc acc cgt tcc ggt gga ttc ctc cac gac gcg gcg gag ttc gac    15216
Ile Ala Thr Arg Ser Gly Gly Phe Leu His Asp Ala Ala Glu Phe Asp
              5060              5065              5070


ccc gag ttc ttc ggg atg agc ccg cgc gag gcc ctg acc acc gac gcc    15264
Pro Glu Phe Phe Gly Met Ser Pro Arg Glu Ala Leu Thr Thr Asp Ala
              5075              5080              5085


cag cag cgg ctg ttg ctg gag acg acc tgg gag gcg ctg gag cgc gcc    15312
Gln Gln Arg Leu Leu Leu Glu Thr Thr Trp Glu Ala Leu Glu Arg Ala
              5090              5095              5100


ggt atg gac ccg gcc acg ctc cgc ggc agc cgc acg ggt gtc ttc gcc    15360
Gly Met Asp Pro Ala Thr Leu Arg Gly Ser Arg Thr Gly Val Phe Ala
5105              5110              5115              5120


ggc gtg atg tac cac gac tac tcg acg ctg ctc tcc ggg cgc gag ttc    15408
Gly Val Met Tyr His Asp Tyr Ser Thr Leu Leu Ser Gly Arg Glu Phe
              5125              5130              5135


gag ggc tac cag ggc agc ggc agc gca ggc agt gtg gcc tcg ggc cgg    15456
Glu Gly Tyr Gln Gly Ser Gly Ser Ala Gly Ser Val Ala Ser Gly Arg
              5140              5145              5150


gtc tcg tac acc ttc ggt ttc gag ggt ccg gcg gtc acg gtg gac acg    15504
Val Ser Tyr Thr Phe Gly Phe Glu Gly Pro Ala Val Thr Val Asp Thr
              5155              5160              5165


gcg tgc tcg tcg tcc ctg gtc gcc ctg cac ctg gca gca cag tcg ctg    15552
Ala Cys Ser Ser Ser Leu Val Ala Leu His Leu Ala Ala Gln Ser Leu
              5170              5175              5180


cgc tcg ggc gag tgc tcg ctg gcg ctc gcg ggc ggt gtg acg gtg atg    15600
Arg Ser Gly Glu Cys Ser Leu Ala Leu Ala Gly Gly Val Thr Val Met
5185              5190              5195              5200


tcc aca ccg ctg acc ttc gtg gag ttc tcc cgc cag ggc gga ctg tcg    15648
Ser Thr Pro Leu Thr Phe Val Glu Phe Ser Arg Gln Gly Gly Leu Ser
              5205              5210              5215


gcg gac ggc cgc tgc aag gcg ttc gcc gat gcg gcc gac ggc gtc ggc    15696
Ala Asp Gly Arg Cys Lys Ala Phe Ala Asp Ala Ala Asp Gly Val Gly
              5220              5225              5230


tgg gcc gaa ggc gcc gga atc ctg gtg ctg gag cgt ctg tcg gac gcc    15744
Trp Ala Glu Gly Ala Gly Ile Leu Val Leu Glu Arg Leu Ser Asp Ala
```

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cgc cgc aac ggg cac cgc atc ctc gcg acg gtg cgc ggc agt gcg gtg    15792
Arg Arg Asn Gly His Arg Ile Leu Ala Thr Val Arg Gly Ser Ala Val
    5250                5255                5260

aac cag gac ggt gcg tcc aat ggt ctg acg gcg ccg aac ggt ccc gcc    15840
Asn Gln Asp Gly Ala Ser Asn Gly Leu Thr Ala Pro Asn Gly Pro Ala
5265                5270                5275                5280

cag cag cgg gtg atc cgg cag gcg ctg gcg agt gcg ggg ctg tcg gcg    15888
Gln Gln Arg Val Ile Arg Gln Ala Leu Ala Ser Ala Gly Leu Ser Ala
            5285                5290                5295

gcg gat gtg gac gcg gtg gag gcg cac ggt acg ggt acg acg ctg ggc    15936
Ala Asp Val Asp Ala Val Glu Ala His Gly Thr Gly Thr Thr Leu Gly
            5300                5305                5310

gat ccg atc gag gcc cag gcg ctg ctc gcg acg tat ggc cag gag cgg    15984
Asp Pro Ile Glu Ala Gln Ala Leu Leu Ala Thr Tyr Gly Gln Glu Arg
            5315                5320                5325

ccg gag gac cgg ccg ttg ctg ctc ggc tcc gtg aag tcc aac atc ggt    16032
Pro Glu Asp Arg Pro Leu Leu Leu Gly Ser Val Lys Ser Asn Ile Gly
            5330                5335                5340

cac gcg caa gcg gct tcg ggt gtt gcc ggt gtc atc aag atg gtg ctg    16080
His Ala Gln Ala Ala Ser Gly Val Ala Gly Val Ile Lys Met Val Leu
5345                5350                5355                5360

gcg atg cgg cac ggt gtg ctg cct cgg acg ctg cat gtc gac gag ccg    16128
Ala Met Arg His Gly Val Leu Pro Arg Thr Leu His Val Asp Glu Pro
            5365                5370                5375

tcg tcg cat gtc gac tgg agc gcc ggt gcc gtc gag ctg ctg acc tcc    16176
Ser Ser His Val Asp Trp Ser Ala Gly Ala Val Glu Leu Leu Thr Ser
            5380                5385                5390

gag gcc gag tgg ccg cag ggc gag ggg ccg cgc cgc gcg ggc gtc tcc    16224
Glu Ala Glu Trp Pro Gln Gly Glu Gly Pro Arg Arg Ala Gly Val Ser
            5395                5400                5405

tcc ttc ggc atc agt ggg acg aac gcg cat gtg atc ctg gag cag ccc    16272
Ser Phe Gly Ile Ser Gly Thr Asn Ala His Val Ile Leu Glu Gln Pro
            5410                5415                5420

gaa ccg gtc gcg gcg gaa acg gaa tcg atc acg ccc gac acc gca ccg    16320
Glu Pro Val Ala Ala Glu Thr Glu Ser Ile Thr Pro Asp Thr Ala Pro
5425                5430                5435                5440

gac gcc gcc gag gac gag gcg gcc gat tcc ggg acg ccg gtg ccg gca    16368
Asp Ala Ala Glu Asp Glu Ala Ala Asp Ser Gly Thr Pro Val Pro Ala
            5445                5450                5455

ctg ctg tcc ggc agg agc gca tcg gcg ctg cgg gcc cag gca gca cga    16416
Leu Leu Ser Gly Arg Ser Ala Ser Ala Leu Arg Ala Gln Ala Ala Arg
            5460                5465                5470
```

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ctg ctg tcc cga ctc gac ggc gat ccg ggg ccg cgg atc act gac gtc    16464
Leu Leu Ser Arg Leu Asp Gly Asp Pro Gly Pro Arg Ile Thr Asp Val
        5475            5480            5485

gcc tac tcc ctc gcg acc ggc cgt tcg gcc ttc ccg cac cgc gcg gtg    16512
Ala Tyr Ser Leu Ala Thr Gly Arg Ser Ala Phe Pro His Arg Ala Val
        5490            5495            5500

atc ctc gcc gcg aac cga gcg gac ctg ctg cac tcg ctg tcc gcc ctg    16560
Ile Leu Ala Ala Asn Arg Ala Asp Leu Leu His Ser Leu Ser Ala Leu
5505            5510            5515            5520

gcc gag ggc cac acc gag gcg ccg gcc gta gtc gca cag gac cga gcc    16608
Ala Glu Gly His Thr Glu Ala Pro Ala Val Val Ala Gln Asp Arg Ala
            5525            5530            5535

cgc tcg ggc aag ctg gcc ttc ctg ttc tcg ggg cag gga tcg caa cgc    16656
Arg Ser Gly Lys Leu Ala Phe Leu Phe Ser Gly Gln Gly Ser Gln Arg
            5540            5545            5550

ctg ggc atg gga cgg gag ttg tac ggt cgc tac ccg gcg ttc gcc gag    16704
Leu Gly Met Gly Arg Glu Leu Tyr Gly Arg Tyr Pro Ala Phe Ala Glu
            5555            5560            5565

gcc ctc gac gcg gtg tgc gcc gcc ctg gac gcc cac ctg gac cgt ccc    16752
Ala Leu Asp Ala Val Cys Ala Ala Leu Asp Ala His Leu Asp Arg Pro
        5570            5575            5580

ctg cgg gac gtc atc tgg ggc gag gac gcg gaa ctg ctg aac cgg acc    16800
Leu Arg Asp Val Ile Trp Gly Glu Asp Ala Glu Leu Leu Asn Arg Thr
5585            5590            5595            5600

ggg tac gcc cag aca ggg ctg ttc gcc atc gag gtg gcc ctg ttc cgc    16848
Gly Tyr Ala Gln Thr Gly Leu Phe Ala Ile Glu Val Ala Leu Phe Arg
            5605            5610            5615

ctg ctg gag tcg tgg ggc gta cgc ccg gac cac ctg ctg ggg cac tcc    16896
Leu Leu Glu Ser Trp Gly Val Arg Pro Asp His Leu Leu Gly His Ser
            5620            5625            5630

atc gga gaa atc gcc gcg gcc cat gtg gcg ggc gtc ctc tcc ctc ccg    16944
Ile Gly Glu Ile Ala Ala Ala His Val Ala Gly Val Leu Ser Leu Pro
            5635            5640            5645

gac gcc tgt gcg ctg gtg gcg gcc cga ggt cgg ctg atg cag caa ctg    16992
Asp Ala Cys Ala Leu Val Ala Ala Arg Gly Arg Leu Met Gln Gln Leu
        5650            5655            5660

ccg tcc ggc ggc gcg atg atg gcg atc cgg gcg acc gag gac gag gtc    17040
Pro Ser Gly Gly Ala Met Met Ala Ile Arg Ala Thr Glu Asp Glu Val
5665            5670            5675            5680

ctt ccg cat ctg gcg gaa ggc gtc tcg ctc gcg gcg gtc aac ggg ccg    17088
Leu Pro His Leu Ala Glu Gly Val Ser Leu Ala Ala Val Asn Gly Pro
            5685            5690            5695
```

40

```
tcg tcg gtc gtg gtc tcc ggc gcc gag gac gag gta ctc gcc ctc gcg    17136
Ser Ser Val Val Val Ser Gly Ala Glu Asp Glu Val Leu Ala Leu Ala
        5700             5705                 5710

gcg cac ttc gag gaa gag gga cgc aag acc acc cga ctg cgg gtc tcg    17184
Ala His Phe Glu Glu Glu Gly Arg Lys Thr Thr Arg Leu Arg Val Ser
        5715             5720                 5725

cac gcc ttc cac tcc ccg ctc atg gaa ccg atg ctg gcc gac ttc cgg    17232
His Ala Phe His Ser Pro Leu Met Glu Pro Met Leu Ala Asp Phe Arg
        5730             5735                 5740

gcc gtc gcc gac ggc atg acc tac gcc gcg ccg cgc atc ccc gtg gtc    17280
Ala Val Ala Asp Gly Met Thr Tyr Ala Ala Pro Arg Ile Pro Val Val
5745                 5750             5755                 5760

tcc aac gtc acc ggc cgg ccc gcc acc gcg gaa gag ctg tgc tgc gcc    17328
Ser Asn Val Thr Gly Arg Pro Ala Thr Ala Glu Glu Leu Cys Cys Ala
                5765             5770             5775

gag tac tgg gtc ggc cac gta cgc gag gcc gta cgg ttc gcc gac ggg    17376
Glu Tyr Trp Val Gly His Val Arg Glu Ala Val Arg Phe Ala Asp Gly
            5780             5785             5790

gtc ggc gcg ctc cgc gag cag ggt gtg acg acg ttc ctg gaa ctc ggc    17424
Val Gly Ala Leu Arg Glu Gln Gly Val Thr Thr Phe Leu Glu Leu Gly
        5795             5800             5805

ccc gac ggc tct ctc tcc gcg ctc gcc gcc gaa tcc gcc gcc gac gac    17472
Pro Asp Gly Ser Leu Ser Ala Leu Ala Ala Glu Ser Ala Ala Asp Asp
        5810             5815             5820

tcc gta ctg gcc ccc gta ctg cgc aag aac cgc ccc gag gca ccg gca    17520
Ser Val Leu Ala Pro Val Leu Arg Lys Asn Arg Pro Glu Ala Pro Ala
5825                 5830             5835                 5840

ctg ctc acg gcc ctg gca cga ctg cac gcc cag ggc acg ccg gtc gac    17568
Leu Leu Thr Ala Leu Ala Arg Leu His Ala Gln Gly Thr Pro Val Asp
            5845             5850             5855

tgg tcc gcc gcc ttc gcc ggt acg ggt gcg cgg tgg gtg gac ctg ccg    17616
Trp Ser Ala Ala Phe Ala Gly Thr Gly Ala Arg Trp Val Asp Leu Pro
            5860             5865             5870

acg tac gca ttc cag cac gag cgg ttc tgg ccg tcg ggc ggg gcg gcg    17664
Thr Tyr Ala Phe Gln His Glu Arg Phe Trp Pro Ser Gly Gly Ala Ala
        5875             5880             5885

cgc gca ggc gat gtg cgg tcc gcg ggc ctg ggc tcg gcc ggg cac ccg    17712
Arg Ala Gly Asp Val Arg Ser Ala Gly Leu Gly Ser Ala Gly His Pro
        5890             5895             5900

ctg ctg ggt gct gcg gtg gaa ctg gcg ggc tcc ggc ggg cgg ttg ctc    17760
Leu Leu Gly Ala Ala Val Glu Leu Ala Gly Ser Gly Gly Arg Leu Leu
5905                 5910             5915                 5920

acc ggg cgg ctg tcc ctg tcc tcg cac ccg tgg ctg gcg gat cac gtg    17808
```

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```
Thr Gly Arg Leu Ser Leu Ser Ser His Pro Trp Leu Ala Asp His Val
              5925              5930              5935

gtg ctg ggc tcc gta ctg gtg ccc ggc acg gcg ctc atg gaa ctg gtg    17856
Val Leu Gly Ser Val Leu Val Pro Gly Thr Ala Leu Met Glu Leu Val
              5940              5945              5950

ctg cgg gcg gcc gac gag gtg gac tgc gcc gcg gtg gac gaa ctc acg    17904
Leu Arg Ala Ala Asp Glu Val Asp Cys Ala Ala Val Asp Glu Leu Thr
              5955              5960              5965

ctc gcc gcg cca ctg gtc ctg ccc gcc tcg ggc gcc gcg atc cag gta    17952
Leu Ala Ala Pro Leu Val Leu Pro Ala Ser Gly Ala Ala Ile Gln Val
              5970              5975              5980

cag gta tgg gtg ggc gag ccc gat gag gcg ggc cgc cgg ccg gtc tcg    18000
Gln Val Trp Val Gly Glu Pro Asp Glu Ala Gly Arg Arg Pro Val Ser
5985              5990              5995              6000

gtc cat gca cgc gag ggc gag ggc cca tgg acg ctg cac gcc gac ggc    18048
Val His Ala Arg Glu Gly Glu Gly Pro Trp Thr Leu His Ala Asp Gly
              6005              6010              6015

gcc ctg gcc ccg gcg gcc gag acg gtg ccg ttc gat acc gcg ata tgg    18096
Ala Leu Ala Pro Ala Ala Glu Thr Val Pro Phe Asp Thr Ala Ile Trp
              6020              6025              6030

ccc ccg cag ggt gcc gag cac ctg gac gcg gcg ggc tgt tac gag cgg    18144
Pro Pro Gln Gly Ala Glu His Leu Asp Ala Ala Gly Cys Tyr Glu Arg
              6035              6040              6045

ttc gcg gac gcc gga ttc gcg tac ggc ccg gtg ttc cag ggc ctg cgg    18192
Phe Ala Asp Ala Gly Phe Ala Tyr Gly Pro Val Phe Gln Gly Leu Arg
              6050              6055              6060

gcg gcc tgg aag ctc ggc gag gac atc tac gcc gag gtc gca ctc ccc    18240
Ala Ala Trp Lys Leu Gly Glu Asp Ile Tyr Ala Glu Val Ala Leu Pro
6065              6070              6075              6080

gaa ggc acg gac ggc aac gcc tac ggc ctg cac ccc gca ctc ttc gac    18288
Glu Gly Thr Asp Gly Asn Ala Tyr Gly Leu His Pro Ala Leu Phe Asp
              6085              6090              6095

gcc gcg ctg cac gca gcg ctc ctg ggc ggc gag gga acg gac gaa gcc    18336
Ala Ala Leu His Ala Ala Leu Leu Gly Gly Glu Gly Thr Asp Glu Ala
              6100              6105              6110

gcg gtc ccc ttc tcc tgg aac ggg gtg acg ctc cac gcc acc ggc gct    18384
Ala Val Pro Phe Ser Trp Asn Gly Val Thr Leu His Ala Thr Gly Ala
              6115              6120              6125

tcc cgg gtg agg gta cgc atc cgt ccc acc gaa ggc ggt acg tcg ata    18432
Ser Arg Val Arg Val Arg Ile Arg Pro Thr Glu Gly Gly Thr Ser Ile
              6130              6135              6140

gcc ctc gtg gac acc gcc ggt gcg ccg gtc gcc tcg gtg cga tcc ctg    18480
Ala Leu Val Asp Thr Ala Gly Ala Pro Val Ala Ser Val Arg Ser Leu
```

42

```
acc gca cgt ccg atc acc gcc ggg cag ttg cag acc ggt gac cgc gat    18528
Thr Ala Arg Pro Ile Thr Ala Gly Gln Leu Gln Thr Gly Asp Arg Asp
                6165                    6170                6175

tcc ctt ttc cag gtc gac tgg acc acc ctc cac ctc acg gac gag cgc    18576
Ser Leu Phe Gln Val Asp Trp Thr Thr Leu His Leu Thr Asp Glu Arg
                6180                    6185                6190

gcg aac tcc ctc gcc ctg ctc ggc aag gac acc gag ggc atc ctc gac    18624
Ala Asn Ser Leu Ala Leu Leu Gly Lys Asp Thr Glu Gly Ile Leu Asp
                6195                    6200                6205

aca ctc tcc ctc cag ccc cac gcg gac ctc gac gac ctc gcg gcg acg    18672
Thr Leu Ser Leu Gln Pro His Ala Asp Leu Asp Asp Leu Ala Ala Thr
                6210                    6215                6220

ggc gtc cac gac acc gtg ctc gcc ccg ctg ccc acc cgg acc gcc gga    18720
Gly Val His Asp Thr Val Leu Ala Pro Leu Pro Thr Arg Thr Ala Gly
6225                    6230                    6235            6240

acg gtg gaa tcc gtc cat gcc gcc acg aca ggg gca ctg gcc ctg atc    18768
Thr Val Glu Ser Val His Ala Ala Thr Thr Gly Ala Leu Ala Leu Ile
                6245                    6250                6255

cgg tcc tgg ctg gcc gac gac cgg ttc gcc gcc tcg cgc ctg gtg ttc    18816
Arg Ser Trp Leu Ala Asp Asp Arg Phe Ala Ala Ser Arg Leu Val Phe
                6260                    6265                6270

gtg acg cgt ggc gcg gtg tcc ggc acg gat ctc gcg ggt gcg tcg gtg    18864
Val Thr Arg Gly Ala Val Ser Gly Thr Asp Leu Ala Gly Ala Ser Val
                6275                    6280                6285

tgg ggc ctg gtg cgg tcg gcg ttg ttg gag cac ccg ggc cgc ttc ggt    18912
Trp Gly Leu Val Arg Ser Ala Leu Leu Glu His Pro Gly Arg Phe Gly
                6290                    6295                6300

ctg gtg gac gtg gac gtg gac caa gac gct gaa gtg ccg ctt gtg cca    18960
Leu Val Asp Val Asp Val Asp Gln Asp Ala Glu Val Pro Leu Val Pro
6305                    6310                    6315            6320

agg gcg ttg gcg tcg gat gaa ccg cag gtg ttg gtg cgt ggt ggt gag    19008
Arg Ala Leu Ala Ser Asp Glu Pro Gln Val Leu Val Arg Gly Gly Glu
                6325                    6330                6335

gtg ctg gcg gcc cgg ctg gtc cgg gcg cag tcc tcg gac acg gtg acg    19056
Val Leu Ala Ala Arg Leu Val Arg Ala Gln Ser Ser Asp Thr Val Thr
                6340                    6345                6350

tgg gat ccg tcc ggt acg gtc ctg atc acc ggc ggg acc ggt ggg ctg    19104
Trp Asp Pro Ser Gly Thr Val Leu Ile Thr Gly Gly Thr Gly Gly Leu
                6355                    6360                6365

ggt cgt agt gtc gcc cgg cac ttg gtg agc gag cac ggg gtg cgc agt    19152
Gly Arg Ser Val Ala Arg His Leu Val Ser Glu His Gly Val Arg Ser
                6370                    6375                6380
```

43

```
ctg ctg ctg gtc agc cgc cgt ggt ccc gcc gcc gag ggt gtc gat gca    19200
Leu Leu Leu Val Ser Arg Arg Gly Pro Ala Ala Glu Gly Val Asp Ala
6385                6390            6395                6400

ctc gtt gcc gaa ctt gcc gag tgc ggc gcg cag gtc acc gtc gag gct    19248
Leu Val Ala Glu Leu Ala Glu Cys Gly Ala Gln Val Thr Val Glu Ala
                6405            6410            6415

tgt gat gtg act gac gcg gtg gcg gtg gcc gat ctg gtg gct cgg cat    19296
Cys Asp Val Thr Asp Ala Val Ala Val Ala Asp Leu Val Ala Arg His
            6420            6425            6430

cgg atc agt gct gtg gtg cat acg gcc ggt gtt ctg gat gac ggt gtg    19344
Arg Ile Ser Ala Val Val His Thr Ala Gly Val Leu Asp Asp Gly Val
            6435            6440            6445

gtg gag tcg ctg acg ccg gag cgg ctg tcg gcg gtg ctg cgt ccg aag    19392
Val Glu Ser Leu Thr Pro Glu Arg Leu Ser Ala Val Leu Arg Pro Lys
            6450            6455            6460

gtg gat gcg gcc tgg aac ctg cac gag gcg acc agg ggt ctg gat ctg    19440
Val Asp Ala Ala Trp Asn Leu His Glu Ala Thr Arg Gly Leu Asp Leu
6465                6470            6475                6480

gat gcg ttt gtg gtg ttc tcg tcc gtg gca ggc acc ttc ggc agt gcg    19488
Asp Ala Phe Val Val Phe Ser Ser Val Ala Gly Thr Phe Gly Ser Ala
                6485            6490            6495

ggt cag gcc aat tac gcg gcg ggt aat gct ttc ctg gac gcg ctg gcg    19536
Gly Gln Ala Asn Tyr Ala Ala Gly Asn Ala Phe Leu Asp Ala Leu Ala
                6500            6505            6510

tat cac cgt cgg gcg gtg ggt ttg ccg gcg gtg tcg ctg gcg tgg ggc    19584
Tyr His Arg Arg Ala Val Gly Leu Pro Ala Val Ser Leu Ala Trp Gly
            6515            6520            6525

cct tgg tcg cag gac ggt ggt atg acc ggc acc ttg agc gac gcc gat    19632
Pro Trp Ser Gln Asp Gly Gly Met Thr Gly Thr Leu Ser Asp Ala Asp
    6530            6535            6540

gtc cag cgc atc gcc cgg cag ggc atg ccg ccg ctg acc gtc gag gag    19680
Val Gln Arg Ile Ala Arg Gln Gly Met Pro Pro Leu Thr Val Glu Glu
6545            6550            6555            6560

ggt ctg gcc ctc ttc gac gcc gcg ctc ggc agc gcc gaa ccc atg gca    19728
Gly Leu Ala Leu Phe Asp Ala Ala Leu Gly Ser Ala Glu Pro Met Ala
            6565            6570            6575

ctc ccc gtc cgc ctg gac ctc gcg gcc cta cgg gca caa ggc gag ccc    19776
Leu Pro Val Arg Leu Asp Leu Ala Ala Leu Arg Ala Gln Gly Glu Pro
            6580            6585            6590

cag cca ctg ctg cgc ggc ctc atc cgg acc ccg ggt cga cgc acg gcg    19824
Gln Pro Leu Leu Arg Gly Leu Ile Arg Thr Pro Gly Arg Arg Thr Ala
        6595            6600            6605
```

44

```
gcg gcc gcg acg gag ggc gac acc gct gcc gcc ttc gcc ggg cgc ctg      19872
Ala Ala Ala Thr Glu Gly Asp Thr Ala Ala Ala Phe Ala Gly Arg Leu
    6610                6615                6620

acc ggg ctg tcg gcg gca gaa gga cgc gag gtc gta ctg ggc gcc gta      19920
Thr Gly Leu Ser Ala Ala Glu Gly Arg Glu Val Val Leu Gly Ala Val
6625                6630                6635                6640

cgc agc cag atc gcg ggg gtc ctc gga cac gcc gaa gcc acg gaa atc      19968
Arg Ser Gln Ile Ala Gly Val Leu Gly His Ala Glu Ala Thr Glu Ile
                6645                6650                6655

gac cag gac cgc gcc ttc ctg gac ctc gga ttc gac tcc ctc acc gcg      20016
Asp Gln Asp Arg Ala Phe Leu Asp Leu Gly Phe Asp Ser Leu Thr Ala
            6660                6665                6670

gtc gaa ctc cgc aac cgc ctg ggc gcc gtc acc gga atc cgc ctg ccg      20064
Val Glu Leu Arg Asn Arg Leu Gly Ala Val Thr Gly Ile Arg Leu Pro
        6675                6680                6685

gcg acc ctg ctc ttc gac tac ccg acg ccg gca gaa ctc gtc gcc cac      20112
Ala Thr Leu Leu Phe Asp Tyr Pro Thr Pro Ala Glu Leu Val Ala His
    6690                6695                6700

ctc cat gcc cgg atc gca ccg gag ccg acc gtc ggc ccg gag gcg ctc      20160
Leu His Ala Arg Ile Ala Pro Glu Pro Thr Val Gly Pro Glu Ala Leu
6705                6710                6715                6720

ctg ggc gaa ctc gaa agg atg gag aag tcc ttc ggc gga ctc gac ctc      20208
Leu Gly Glu Leu Glu Arg Met Glu Lys Ser Phe Gly Gly Leu Asp Leu
                6725                6730                6735

acg gag gag atg cac gaa cag ata gcc ggc cgt ctg gaa gtc ctc cgg      20256
Thr Glu Glu Met His Glu Gln Ile Ala Gly Arg Leu Glu Val Leu Arg
                6740                6745                6750

gcc aag tgg gac gcc ctg cgg gac acg gca gcg gca gcc ggg cac gac      20304
Ala Lys Trp Asp Ala Leu Arg Asp Thr Ala Ala Ala Ala Gly His Asp
            6755                6760                6765

ggt tcc ccg tcc gac gag gac ttc gac ttc gag tcc gcc tcc gac gac      20352
Gly Ser Pro Ser Asp Glu Asp Phe Asp Phe Glu Ser Ala Ser Asp Asp
        6770                6775                6780

gag gtc ttc gac ctc ctc gac aac gaa ctc ggc ctg tcc tga            20394
Glu Val Phe Asp Leu Leu Asp Asn Glu Leu Gly Leu Ser
6785                6790                6795


<210> 4
<211> 6797
<212> PRT
<213> Streptomyces natalensis

<400> 4
Met Ser Asn Glu Glu Lys Leu Arg Glu Tyr Leu Lys Arg Ala Ile Ala
 1               5                   10                  15
```

45

```
Asp Leu His Glu Thr Arg Gln Gln Leu Asp Glu Thr Glu Ala Lys Gln
            20                  25              30

Arg Glu Pro Leu Ala Ile Val Ser Met Ala Cys Arg Phe Pro Gly Gly
            35                  40              45

Val Arg Ser Pro Glu Glu Leu Trp Glu Leu Leu Arg Asp Gly Val Asp
    50                  55              60

Ala Val Ser Ser Phe Pro Arg Asn Arg Gly Trp Asp Leu Asp Ala Leu
65                  70              75                      80

Tyr His Ser Asp Pro Ala His Gln Gly Thr Ser Tyr Ala Arg Glu Gly
            85                  90              95

Gly Phe Leu His Asp Ala Gly Glu Phe Asp Pro Gly Phe Phe Gly Ile
            100                 105             110

Ser Pro Arg Glu Ala Leu Ala Met Asp Pro Gln Gln Arg Leu Leu Leu
        115                 120             125

Glu Thr Ala Trp Glu Ala Val Glu Arg Ala Gly Ile Asp Pro Glu Ser
    130                 135             140

Leu Ala Gly Ser Arg Thr Gly Val Phe Val Gly Thr Gly His Gly Gly
145                 150             155                     160

Tyr Asp Ala Glu Gly Arg Arg Arg Ala Asp Glu Val Gly Gly His Leu
            165                 170             175

Leu Thr Gly Asn His Ile Ser Ile Ala Ser Gly Arg Ile Ser Tyr Val
            180                 185             190

Leu Gly Leu Glu Gly Pro Ala Leu Thr Val Asp Thr Ala Cys Ser Ser
        195                 200             205

Ser Leu Val Ala Leu His Leu Ala Met His Ala Leu Arg Arg Asp Glu
    210                 215             220

Cys Ala Met Ala Leu Val Gly Gly Ala Thr Val Met Ser Thr Pro Gln
225                 230             235                     240

Met Phe Val Glu Phe Ser Arg Gln Arg Gly Leu Ala Pro Asp Gly Arg
            245                 250             255

Cys Lys Pro Phe Ala Ala Ala Ala Asp Gly Thr Gly Trp Ser Glu Gly
            260                 265             270

Val Gly Leu Leu Leu Val Glu Arg Leu Ser Asp Ala Val Arg Asn Gly
        275                 280             285

Tyr Pro Val Leu Ala Val Leu Lys Gly Ser Ala Val Asn Gln Asp Gly
    290                 295             300

Ala Ser Asn Gly Leu Thr Ala Pro Asn Gly Pro Ser Gln Gln Arg Val
305                 310             315                     320
```

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Ile Arg Gln Ala Leu Thr Gly Ala Gly Leu Ala Ala Ser Asp Ile Asp
            325   330   335

Ala Val Glu Ala His Gly Thr Gly Thr Thr Leu Gly Asp Pro Val Glu
            340   345   350

Ala His Ala Leu Leu Ala Thr Tyr Gly Gln Gln Arg Ala Ala Asp Arg
            355   360   365

Pro Cys Gly Leu Gly Ser Met Lys Ser Asn Ile Gly His Thr Gln Ala
    370   375   380

Ala Ala Gly Ile Ala Gly Val Met Lys Met Val Leu Ala Met Arg His
385   390   395   400

Gly His Leu Pro Arg Thr Leu His Leu Asp Glu Pro Thr Gly His Val
            405   410   415

Asp Trp Ser Glu Gly Asn Ala Arg Leu Leu Ala Glu Pro Glu Pro Trp
            420   425   430

Pro Ser Ala Gly Arg Pro Arg Arg Ala Ala Val Ser Ser Phe Gly Ile
            435   440   445

Ser Gly Thr Asn Ala His Val Ile Leu Glu Gln Ala Pro Ala His Glu
    450   455   460

Ala Glu Pro Ala Pro Glu Pro Ala Ala Arg Pro Gly Ala Leu Pro Trp
465   470   475   480

Ile Leu Ser Ala Arg Thr Glu Ala Gly Leu Arg Ala Gln Ala Asp Arg
            485   490   495

Leu Gly Arg His Leu Arg Asp Arg Ala Asp Leu Glu Pro Ala Ala Val
            500   505   510

Ala His Ala Leu Ala Asp Thr Arg Thr Leu Met Glu His Arg Ala Val
            515   520   525

Val Val Ala Gly Asp Arg Glu Glu Phe Leu Arg Gly Leu Asp Ala Leu
    530   535   540

Ala Ala Gly Arg Thr Ala Asn Gly Leu Val Ser Gly Val Ala Val Lys
545   550   555   560

Ala Ala Ser Ala Phe Leu Phe Ala Gly Gln Gly Ser Gln Arg Pro Gly
                565   570   575

Met Gly Arg Glu Leu His Ala Ala His Pro Val Phe Ala Thr Ala Phe
            580   585   590

Asp Ala Val Cys Ala Glu Leu Asp Pro His Leu Asp Arg Pro Leu Arg
            595   600   605

Asp Ile Val Phe Ala Glu Glu Gly Ser Ala Glu Ala Ala Leu Leu Asp
    610   615   620

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Gln Thr Ala Tyr Thr Gln Ala Ala Leu Phe Ala Leu Glu Thr Ala Leu
625             630             635             640

Phe Arg Leu Val Glu Ser Trp Gly Val Ala Pro Arg Phe Val Ala Gly
                645             650             655

His Ser Ile Gly Glu Leu Thr Ala Ala His Val Ser Gly Val Leu Thr
                660             665             670

Leu His Asp Ala Ala Arg Leu Val Ala Ala Arg Gly Thr Leu Met Gln
            675             680             685

Ala Leu Pro Ala Gly Gly Ala Met Val Ala Val Gln Ala Thr Glu Asp
    690             695             700

Glu Ile Arg Glu Arg Leu Ala Gly His Glu Asp His Val Ala Leu Ala
705             710             715             720

Ala Ala Asn Gly Pro Asp Ser Thr Val Ile Ser Gly Asp Glu Gln Ala
                725             730             735

Val Thr Glu Ile Ala Ala His Trp Glu Ala Gln Gly Arg Arg Thr Lys
            740             745             750

Arg Leu Arg Val Ser His Ala Phe His Ser Pro His Met Asp Asp Met
    755             760             765

Leu Glu Asp Phe Arg Arg Val Ala Arg Gly Leu Thr Phe His Ala Pro
    770             775             780

Arg Ile Pro Val Val Ser Thr Val Thr Gly Ala Leu Ala Thr Glu Asp
785             790             795             800

Glu Leu Arg Ser Pro Asp Tyr Trp Val Arg Gln Val Arg Glu Thr Val
            805             810             815

Arg Phe Cys Ala Ala Val Arg Thr Leu Glu Ala Glu Gly Val Thr Thr
            820             825             830

Phe Val Glu Ile Gly Thr Gly Gly Val Leu Thr Pro Met Val Gln Asp
    835             840             845

Cys Leu Thr Thr Leu Glu Glu Pro Val Leu Val Pro Leu Leu Arg Thr
    850             855             860

Gly Arg Pro Glu Thr Val Ala Leu Thr Glu Gly Val Ala Thr Ala Phe
865             870             875             880

Val His Gly Val Pro Val Asp Arg Ser Ala Phe Pro Gly Ala Pro Gly
            885             890             895

Thr Ser Arg Ala Asp Leu Pro Thr Tyr Ala Phe Gln Arg Gln Trp Tyr
        900             905             910

Trp Leu Asp Pro Ala Asp His Asp Glu Gly Glu Ala Ala Ala Ala Glu
        915             920             925
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Ala Gly Glu Ala Gly Phe Trp Ala Ala Val Glu Arg Glu Asp Leu Gln
    930             935             940

Glu Leu Ser Ala Val Leu Ala Ile Asp Gly Ser Glu Ala Asp Ser Leu
945             950             955             960

Gly Ser Phe Leu Pro Thr Leu Ser Ser Trp Arg Arg Gln Arg Arg Thr
            965             970             975

Gln Ala Ala Ala Asp Arg Phe Ser Tyr Arg Thr His Trp Ala Pro Arg
            980             985             990

Thr Ala Ser Gly Gly Pro Thr Ala Thr Gly His Trp Leu Val Val Leu
            995             1000            1005

Pro Glu Gly Gly Thr Asp Asp Pro Trp Thr Ala Arg Leu Leu Asp Ala
    1010            1015            1020

Leu  Asn Asp Gln Gly Leu His Thr Asp Val Arg Glu Leu Pro Ala Asp
1025            1030            1035            1040

His Glu Pro Asp Ala Trp Gly Arg His Pro Val Asp Gly Val Leu Cys
            1045            1050            1055

Leu Leu Ala Leu Asp Glu Arg Pro Thr Arg Ser Cys Pro Pro Tyr Arg
            1060            1065            1070

Arg Gly Leu Ala Ala Thr Thr Asn Ala Ala Ala Arg Pro Glu Gly Ala
            1075            1080            1085

Gly Ile Gln Ala Pro Leu Trp Cys Val Thr Arg Gly Ala Val Ala Val
            1090            1095            1100

Asp  Arg His Glu Ala Leu Lys Ser Pro Leu Gln Ala Gln Thr Trp Gly
1105            1110            1115            1120

Leu Gly Arg Val Ala Ala Leu Glu Ser Pro Gln Ser Trp Gly Gly Leu
            1125            1130            1135

Ile Asp Leu Pro Asp Asn Leu Asp Gly Arg Ala Val Ser Ala Leu Leu
            1140            1145            1150

Ser Thr Leu Ala Gly Glu Glu Asp Gln Val Ala Val Arg Pro Ala Gly
            1155            1160            1165

Val Phe Ala Arg Arg Leu Glu Arg Ile Thr Pro Gly Gly Asp Thr Gly
    1170            1175            1180

Asp  Arg Trp Ser Thr His Gly Thr Val Leu Val Thr Gly Gly Thr Gly
1185            1190            1195            1200

Ala Leu Gly Ala His Leu Ala His Trp Leu Ala Asp Ala Gly Ala Glu
            1205            1210            1215

His Leu Val Leu Thr Gly Arg Arg Gly Pro Gln Ala Pro Gly Ala Pro
            1220            1225            1230
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Glu Leu Ala Ala Ala Leu Thr Asp Arg Gly Val Lys Val Thr Leu Ala
        1235                1240                1245

Ala Cys Asp Ala Ala Asp Arg Asp Ala Leu Ala Ala Val Leu Ala Asp
        1250                1255                1260

Ile  Pro Pro His Leu Pro Leu Thr Gly Val Val His Ala Ala Gly Val
1265                1270                1275                1280

Leu Asp Asp Gly Val Leu Asp Ala Leu Thr Pro Glu Arg Phe Glu Thr
            1285                1290                1295

Val Leu Arg Pro Lys Ala Arg Ala Ala Gln Asn Leu His Glu Leu Thr
            1300                1305                1310

Gln Asp Leu Asp Leu Asp His Phe Val Leu Phe Ser Ser Ile Val Gly
            1315                1320                1325

Val Leu Gly Asn Ala Gly Gln Ala Asn Tyr Ala Ala Ala Asn Ala Tyr
            1330                1335                1340

Leu  Asp Ala Leu Ala Glu His Arg Leu Ala Gln Gly Leu Pro Ala Thr
1345                1350                1355                1360

Ser Val Ser Trp Gly Pro Gly Gln Ala Ala Ala Trp His Asp Ser Asp
            1365                1370                1375

Ala Ala Asp Arg Met Ser Arg Asp Gly Leu Leu Pro Met Ala Ala Ala
            1380                1385                1390

Pro Arg Arg Arg Pro Ala Pro Ala Leu Ala Gln Gly Met Thr Gln Val
            1395                1400                1405

Thr Val Ala Asp Ile Asp Trp Ser Ala Tyr Ala Pro Ala Leu Thr Ala
            1410                1415                1420

Val  Arg Pro Ser Pro Leu Ile Gly Asp Leu Pro Glu Ala Arg Arg Ala
1425                1430                1435                1440

Leu Gly Pro Ala Glu Gly Pro Arg Arg Glu Arg Ser Pro Leu Arg Asp
            1445                1450                1455

Arg Ile Gly Ala Leu Pro Pro Ala Glu Gln Glu Lys Ala Phe Leu Thr
            1460                1465                1470

Met Val Arg Glu Glu Ala Ala Arg Val Leu Gly His Pro Ser Pro Asp
            1475                1480                1485

Thr Val Asp Ala Gln Arg Ala Phe Arg Glu Gln Gly Phe Asp Ser Leu
            1490                1495                1500

Met  Ala Val Asp Leu Arg Asn Arg Leu Ser Ala Ala Thr Gly Leu Arg
1505                1510                1515                1520

Leu Pro Ala Thr Leu Leu Phe Asp His Pro Thr Pro Leu Ala Ala Ala
            1525                1530                1535
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Ala Cys Leu Arg Ser Glu Val Leu Gly Ala Ala Gly Pro Ala Thr Val
        1540                1545                1550

Val Gln Ala Ser Thr Ala Ala Leu Asp Glu Pro Val Ala Ile Ile Gly
        1555                1560                1565

Met Ala Cys Arg Phe Pro Gly Gly Val His Ser Pro Glu Ala Leu Trp
    1570                1575                1580

Arg  Leu Leu Ala Glu Gly Gly Asp Ala Ile Thr Pro Met Pro Ala Asp
1585                1590                1595                1600

Arg Gly Trp Asp Leu Asp Arg Leu Tyr His Pro Asp Pro Asp His Gln
            1605                1610                1615

Gly Thr Ser Tyr Ala Arg Gly Gly Gly Phe Leu Asp Gly Ala Ala Asp
            1620                1625                1630

Phe Asp Ala Asp Phe Phe Gly Ile Ser Pro Arg Glu Ala Leu Ala Met
        1635                1640                1645

Asp Pro Gln Gln Arg Leu Leu Leu Glu Thr Trp Glu Val Leu Glu Gln
    1650                1655                1660

Ala  Gly Ile Asp Pro Glu Ser Leu Arg Gly Ser Ser Thr Gly Val Phe
1665                1670                1675                1680

Ala Gly Thr Asn Thr Gln Asp Tyr Gly Thr Ala Leu Asp Ala Ala Gln
            1685                1690                1695

Asp Glu Ala Gly Gly His Arg Leu Thr Gly Asn Ala Met Ser Val Val
            1700                1705                1710

Ser Gly Arg Val Ser Tyr Thr Phe Gly Phe Glu Gly Pro Ala Leu Thr
        1715                1720                1725

Val Asp Thr Ala Cys Ser Ser Ser Leu Val Ala Leu His Met Ala Ala
    1730                1735                1740

Gln  Ala Leu Arg Gln Gly Glu Cys Ser Leu Ala Val Ala Gly Gly Val
1745                1750                1755                1760

Thr Val Met Ala Thr Pro Ser Ser Phe Val Glu Phe Ala Arg Gln Arg
            1765                1770                1775

Gly Leu Ala Pro Asp Gly Arg Cys Lys Pro Phe Ala Ala Ala Ala Asp
        1780                1785                1790

Gly Thr Gly Trp Ser Glu Gly Val Gly Leu Leu Leu Val Glu Arg Leu
        1795                1800                1805

Ser Asp Ala Arg Arg Asn Gly His Gln Val Leu Ala Val Val Arg Gly
    1810                1815                1820

Ser  Ala Val Asn Gln Asp Gly Ala Ser Asn Gly Leu Ser Ala Pro Ser
1825                1830                1835                1840
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Gly Pro Ser Gln Gln Arg Val Ile Arg Gln Ala Leu Ala Asn Ala Arg
            1845   1850   1855

Val Ala Ala Ser Glu Val Asp Ala Val Glu Ala His Gly Thr Gly Thr
            1860   1865   1870

Thr Leu Gly Asp Pro Ile Glu Ala Gln Ala Leu Leu Ala Thr Tyr Gly
            1875   1880   1885

Gln Glu Arg Pro Leu Leu Leu Gly Ala Val Lys Ser Asn Leu Gly His
        1890   1895   1900

Thr Gln Ala Ala Ala Gly Val Ala Gly Val Met Lys Met Val Leu Ala
1905   1910   1915   1920

Met Arg His Gly Met Leu Pro Arg Thr Leu His Val Asp Glu Pro Thr
            1925   1930   1935

Gly His Val Asp Trp Thr Ala Gly Ala Val Glu Leu Leu Thr Glu His
            1940   1945   1950

Thr Asp Trp Pro Glu Thr Gly His Pro Arg Arg Ala Ala Val Ser Ala
        1955   1960   1965

Phe Gly Ile Ser Gly Thr Asn Ala His Val Val Leu Glu Leu Pro Ala
        1970   1975   1980

Ala Glu Gln Pro Leu Val Glu Gln Pro Ser Ala Ala Glu Pro Asp Ala
1985   1990   1995   2000

Pro Ala Thr Ala Pro Asp Arg Thr Pro Thr Ala Ser Asp Gly Thr Ala
            2005   2010   2015

Pro Leu Leu Leu Ser Ala Lys Ser Glu Ser Ala Leu Arg Ala Gln Ala
            2020   2025   2030

Ala Arg Leu His Ser His Leu Glu Arg Asp Pro Ala Leu Arg Leu Thr
        2035   2040   2045

Asp Ala Ala Tyr Thr Leu Met Thr His Arg Thr Ala Phe Ala His Arg
        2050   2055   2060

Ala Ala Val Arg Ala Ala Asp His Glu Ala Ala Leu Arg Ala Leu Thr
2065   2070   2075   2080

Ala Leu Ala Ala Gly Glu Ala Asp Pro Ala Val Asp Thr Gly Thr Ala
            2085   2090   2095

His Thr Gly Arg Asp Ala Val Leu Phe Ser Gly Gln Gly Ser Gln Arg
        2100   2105   2110

Ile Gly Met Gly Arg Glu Leu Ser Gly Arg Tyr Pro Val Phe Ala Glu
        2115   2120   2125

Ala Phe Asp Thr Val Cys Ala Ala Leu Asp Glu His Leu Asp Arg Pro
    2130   2135   2140

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Leu   Arg Asp Val Val Arg Gly Glu Asp Glu Glu Leu Leu Asn Arg Thr
2145                    2150            2155            2160

Val Tyr Ala Gln Ala Gly Leu Phe Ala Ile Glu Val Ala Leu Phe Arg
                2165            2170            2175

Leu Val Glu Ser Trp Gly Val Arg Pro His Tyr Val Ala Gly His Ser
            2180            2185            2190

Val Gly Glu Ile Ala Ala Ala His Val Ala Gly Val Phe Ser Leu Ala
            2195            2200            2205

Asp Ala Cys Ala Leu Val Ala Ala Arg Gly Arg Leu Met Gln Ala Leu
        2210            2215            2220

Pro   Ala Gly Gly Ala Met Ala Ala Ile Arg Ala Thr Glu Asp Glu Val
2225                    2230            2235            2240

Leu Pro His Leu Ala Asp Ser Val Ser Ile Ala Ala Val Asn Gly Pro
                2245            2250            2255

Ser Ser Val Val Val Ser Gly Ala Glu His Ala Val Leu Ser Ile Ala
            2260            2265            2270

Ala His Phe Glu Gly Ala Gly Arg Lys Thr Thr Arg Leu Arg Val Ser
        2275            2280            2285

His Ala Phe His Ser Pro Leu Met Asp Pro Met Leu Ala Asp Phe Arg
        2290            2295            2300

Ala   Val Ala Glu Gly Leu Thr Tyr Gly Glu Pro Glu Leu Ala Val Val
2305                    2310            2315            2320

Ser Asn Val Thr Gly Gln Leu Ala Thr Pro Asp Gln Leu Arg Thr Pro
                2325            2330            2335

Glu Tyr Trp Val Thr His Val Arg Ala Ala Val Arg Phe Ala Asp Gly
            2340            2345            2350

Ile Arg Ala Leu Gly Ala Glu Gly Val Thr Arg Phe Leu Glu Leu Gly
            2355            2360            2365

Pro Asp Gly Val Leu Ser Ala Leu Ala Arg Glu Ser Ala Pro Asp Asp
        2370            2375            2380

Ala   Val Cys Thr Pro Val Leu Arg Lys Asp Arg Ser Glu Ala Ala Thr
2385                    2390            2395            2400

Leu Leu Ala Ala Leu Thr His Leu His Val His Gly Thr Glu Ile Asp
                2405            2410            2415

Trp Thr Ala Phe Leu Ala Gly Arg Asp Ala His Ala Val Asp Leu Pro
            2420            2425            2430

Thr Tyr Ala Phe Gln His Gln Arg Phe Trp Pro Thr Pro Asp His Thr
            2435            2440            2445
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Arg Thr Gly Asp Leu Gly Ala Val Gly Leu Glu Ala Thr Gly His Pro
   2450                2455                2460

Leu  Leu Ser Ala Ala Val Glu Leu Pro Asp Gly Glu Gly Leu Leu Phe
2465                2470                2475                2480

Thr Thr Arg Leu Ser Leu Gln Thr His Pro Trp Leu Ala Gly His Val
             2485                2490                2495

Val Met Gly Ser Val Leu Leu Pro Gly Thr Ala Phe Ala Glu Leu Ala
             2500                2505                2510

Leu Arg Ala Ala Asp Glu Val Gly Cys Asp Arg Val Asp Glu Leu Thr
             2515                2520                2525

Leu Ala Ala Pro Leu Val Leu Pro Glu His Gly Gly Val Gln Leu Gln
             2530                2535                2540

Leu  Arg Val Gly Pro Ala Asp Ala Ser Gly Arg Arg Thr Leu Thr Ala
2545                2550                2555                2560

Arg Ser Arg Ala Glu Gly Asp Gly Asp Arg Pro Trp Val Gln His Ala
             2565                2570                2575

Thr Gly Val Leu Ala Glu Gly Glu Ser Thr Pro Glu Pro Gly Tyr Asp
             2580                2585                2590

Phe His Thr Glu Ser Trp Pro Pro Ala Asp Ala Ala Pro Val Glu Leu
             2595                2600                2605

Ser Gly Leu Tyr Pro Asp Phe Ala Ala His Gly Phe Asp Tyr Gly Pro
             2610                2615                2620

His  Phe Gln Gly Leu Arg Thr Ala Trp Arg Arg Gly Asp Glu Val Phe
2625                2630                2635                2640

Ala Glu Val Ala Leu Pro Ala Glu Ala Glu Gly Glu Ala Ser Ala Tyr
             2645                2650                2655

Gly Leu His Pro Ala Leu Leu Asp Ala Ala Leu His Val Val Ala Phe
             2660                2665                2670

Asn Gly Val Asp Arg Gly Val Val Pro Phe Ser Trp Glu Ser Val Ala
             2675                2680                2685

Leu His Ala Thr Gly Ala Ser Ala Val Arg Ile Arg Val Val Arg His
      2690                2695                2700

Ser  Gly Asp Thr Val Ser Val Asp Val Ala Asp Thr Thr Gly Glu Pro
2705                2710                2715                2720

Val Ala Ser Ile Gly Thr Leu Val Leu Arg Ala Val Ser Ala Asp Gln
             2725                2730                2735

Leu Ala Gly Gly Ala Asp Pro Ala Val Arg Asp Ala Leu Phe Arg Val
      2740                2745                2750
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Gln Trp Asn Pro Val Arg Leu Pro Pro Ala Gly Ala Ala Val Thr Val
     2755   2760   2765

Ala Thr Leu Gly Ser Leu Ala Gly Ala Pro Phe Asp Gly Tyr Pro Asp
     2770   2775   2780

Leu Ala Ser Leu Ala Arg Ser Gly Arg Val Ala Gly Ala Val Leu Val
2785   2790   2795   2800

Pro Val Glu Ala Gly Ala Gly Glu Val Val Ala Asp Asp Val Val Gly
         2805   2810   2815

Ala Thr His Ala Thr Ala Ala Arg Ala Leu Asp Leu Ala Arg Ser Trp
         2820   2825   2830

Leu Ala Asp Asp Arg Phe Ala Ala Ser Arg Leu Val Phe Val Thr Arg
     2835   2840   2845

Gly Ala Val Ser Gly Ala Asp Leu Ala Gly Ala Ala Val Trp Gly Leu
     2850   2855   2860

Val Arg Ser Ala Leu Ser Glu His Pro Gly Arg Phe Gly Leu Val Asp
2865   2870   2875   2880

Leu Asp Asp Asp Ala Glu Leu Ala Leu Val Pro Arg Val Leu Ala Ser
         2885   2890   2895

Asp Glu Pro Gln Leu Leu Val Arg Gly Gly Glu Val Leu Ala Ala Arg
         2900   2905   2910

Leu Ala Arg Ala Gln Ser Ser His Ala Val Thr Trp Asp Pro Ser Gly
     2915   2920   2925

Thr Val Leu Val Thr Gly Gly Thr Gly Gly Leu Gly Arg Val Met Ala
     2930   2935   2940

Arg His Leu Val Val Glu His Gly Val Arg Asn Leu Leu Leu Val Ser
2945   2950   2955   2960

Arg Arg Gly Pro Ala Ala Glu Gly Ala Glu Glu Leu Val Thr Glu Leu
         2965   2970   2975

Arg His Ser Gly Ala Glu Val Ala Val Glu Ala Cys Asp Val Thr Asp
         2980   2985   2990

Ala Ala Ala Val Ala Asp Leu Val Ala Arg His Arg Ile Ser Ala Val
         2995   3000   3005

Val His Thr Ala Gly Val Leu Asp Asp Gly Val Val Glu Ser Leu Thr
     3010   3015   3020

Pro Glu Arg Leu Ser Ala Val Leu Arg Pro Lys Val Asp Ala Ala Trp
3025   3030   3035   3040

Asn Leu His Glu Ala Thr Arg Asp Leu Asp Leu Asp Ala Phe Val Val
         3045   3050   3055

55

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Phe Ser Ser Val Ala Gly Thr Ile Gly Ser Pro Gly Gln Ala Asn Tyr
         3060                3065                3070

Ala Ala Gly Asn Ala Phe Leu Asp Ala Leu Ala His His Arg Arg Ala
         3075                3080                3085

Ala Gly Leu Pro Ala Ala Ser Leu Ala Trp Gly Pro Trp Ser Arg Asp
    3090                3095                3100

Gly  Gly Met Thr Gly Thr Leu Thr Asp Val Asp Ser Ser Ala Ser Pro
3105                3110                3115                3120

Gly Arg His Ala Arg Thr His Pro Arg Thr Gly Arg Gly Leu Phe Asp
         3125                3130                3135

Ala Ala Leu Ala Ala Gly Asp Ala His Leu Leu Pro Val Arg Phe Asp
         3140                3145                3150

Trp Ala Ser Leu Arg Ala Gln Gly Glu Val Pro Pro Leu Leu Arg Gly
         3155                3160                3165

Leu Ile Arg Thr Arg Ala Arg Arg Ser Ala Val Gly Gly Ser Ala Ala
    3170                3175                3180

Ala  Ala Gly Leu Val Gly Arg Leu Ser Gly Arg Gly Thr Val Glu Arg
3185                3190                3195                3200

Arg Glu Val Leu Leu Asp Leu Val Arg Ala Gln Ile Ala Val Val Leu
         3205                3210                3215

Gly His Ala Asn Pro Glu Thr Ile Glu Ser Thr Arg Val Phe Gln Asp
          3220                3225                3230

Leu Gly Phe Asp Ser Leu Thr Ala Val Glu Leu Arg Asn Arg Leu Asn
    3235                3240                3245

Asn Ala Thr Gly Leu Arg Leu Ser Ala Thr Ala Val Phe Asp Tyr Pro
    3250                3255                3260

Thr  Ala Asp Ala Leu Val Asp Phe Leu Leu Asp Glu Leu Phe Gly Ala
3265                3270                3275                3280

Gln Glu Glu Ala Glu Leu Pro Ala Pro Val Pro Ser Pro Ala Gly Ala
              3285                3290                3295

Ala Asp Asp Pro Val Val Ile Val Gly Met Ser Cys Arg Tyr Pro Gly
         3300                3305                3310

Gly Val Gly Ser Pro Glu Asp Leu Trp Arg Leu Val Ser Glu Gly Val
    3315                3320                3325

Asp Ala Val Ser Asp Phe Pro Thr Asp Arg Gly Trp Asp Val Glu Ser
    3330                3335                3340

Leu  Tyr Ser Pro Asp Pro Glu Ala Leu Gly Thr Ser Tyr Thr Arg Ser
3345                3350                3355                3360
```

Gly Gly Phe Leu His Glu Ala Ala Glu Phe Asp Pro Asp Phe Phe Gly
          3365   3370   3375

Met Ser Pro Arg Glu Ala Leu Ala Thr Asp Ala Gln Gln Arg Leu Leu
          3380   3385   3390

Leu Glu Thr Thr Trp Glu Ala Ile Glu Arg Thr Gly Ile Asp Pro Ala
          3395   3400   3405

Ser Leu Arg Gly Ser Arg Thr Gly Val Phe Ala Gly Val Met Tyr Thr
     3410   3415   3420

Asp Tyr Gly Asp Leu Leu Val Gly Asp Gln Phe Glu Gly Tyr Arg Ser
3425   3430   3435   3440

Asn Gly Ser Ala Ala Ser Ile Ala Ser Gly Arg Val Ser Tyr Thr Phe
          3445   3450   3455

Gly Phe Glu Gly Pro Ala Val Thr Val Asp Thr Ala Cys Ser Ser Ser
          3460   3465   3470

Leu Val Ala Leu His Trp Ala Ala Gln Ser Leu Arg Ser Gly Glu Cys
          3475   3480   3485

Ser Leu Ala Val Ala Gly Gly Val Thr Val Met Ser Thr Pro Thr Thr
     3490   3495   3500

Phe Val Glu Phe Ser Arg Gln Arg Gly Leu Ser Ala Asp Gly Arg Cys
3505   3510   3515   3520

Lys Ala Phe Ala Asp Ala Ala Asp Gly Val Gly Trp Gly Glu Gly Val
          3525   3530   3535

Gly Met Leu Val Leu Glu Arg Leu Ser Asp Ala Arg Arg Asn Gly His
          3540   3545   3550

Arg Val Leu Ala Val Val Arg Gly Ser Ala Val Asn Gln Asp Gly Ala
     3555   3560   3565

Ser Asn Gly Leu Thr Ala Pro Asn Gly Pro Ala Gln Gln Arg Val Ile
     3570   3575   3580

Arg Gln Ala Leu Ala Ser Ala Gly Leu Ser Ala Ala Asp Val Asp Ala
3585   3590   3595   3600

Val Glu Ala His Gly Thr Gly Thr Thr Leu Gly Asp Pro Ile Glu Ala
          3605   3610   3615

Gln Ala Leu Leu Ala Thr Tyr Gly Gln Glu Arg Pro Glu Asp Arg Pro
          3620   3625   3630

Leu Leu Leu Gly Ser Val Lys Ser Asn Ile Gly His Ala Gln Ala Ala
          3635   3640   3645

Ser Gly Val Ala Gly Val Ile Lys Met Val Leu Ala Met Arg His Gly
     3650   3655   3660

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Val   Leu Pro Arg Thr Leu His Val Asp Glu Pro Ser Ser His Val Asp
3665              3670          3675          3680

Trp Ser Ala Gly Ala Val Glu Leu Leu Thr Ser Glu Ala Glu Trp Pro
         3685          3690          3695

Gln Gly Glu Gly Pro Arg Arg Ala Gly Val Ser Ser Phe Gly Val Ser
     3700          3705          3710

Gly Thr Asn Ala His Val Ile Leu Glu Gln Pro Gly Pro Asp Ala Ala
     3715          3720          3725

Asp Ala Ala Pro Asp Ala Thr Val Thr Asp Pro Gly Ala Leu Ala Trp
     3730          3735          3740

Val   Leu Ser Ala Arg Asn Glu Ala Ala Leu Arg Cys Gln Ala Ala Arg
3745              3750          3755          3760

Leu Leu Ser Leu Val Ala Gly Ser Asp Ala Leu Cys Ala Arg Asp Ile
         3765          3770          3775

Gly His Ser Leu Val Thr Gly Arg Ser Ser Phe Ala His Arg Ala Val
         3780          3785          3790

Val Trp Gly Gln Asp Arg Asp Ala Leu Val Arg Ala Leu Ser Ala Leu
         3795          3800          3805

Ala Val Gly Glu Ala Asp Ala Gly Leu Ala Glu Gly Ala Ser Gly Ala
     3810          3815          3820

Gly   Arg Thr Ala Phe Leu Phe Ser Gly Gln Gly Ser Gln Arg Leu Gly
3825              3830          3835          3840

Met Gly Trp Glu Leu Tyr Ala Arg Tyr Pro Val Phe Ala Asp Ala Phe
         3845          3850          3855

Asp Ala Val Cys Ala Ala Leu Asp Glu His Leu Glu Arg Pro Leu Arg
     3860          3865          3870

Asp Val Val Trp Gly Glu Asp Ala Glu Leu Leu Asn Gln Thr Ala Tyr
     3875          3880          3885

Ala Gln Ala Gly Leu Phe Ala Ile Glu Val Ala Leu Tyr Arg Leu Ala
     3890          3895          3900

Glu   Ser Trp Gly Met Arg Pro Asp Phe Val Ala Gly His Ser Ile Gly
3905              3910          3915          3920

Glu Val Ala Ala Ala His Val Ser Gly Val Phe Ser Leu Pro Asp Ala
         3925          3930          3935

Cys Ala Leu Val Ala Ala Arg Gly Arg Leu Met Gln Gln Leu Pro Ser
         3940          3945          3950

Gly Gly Ala Met Met Ala Ile Arg Ala Thr Glu Asp Glu Val Leu Pro
     3955          3960          3965
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His Leu Ala Glu Gly Val Ser Leu Ala Ala Val Asn Gly Pro Ser Ser
    3970   3975   3980

Val Val Ile Ser Gly Ala Glu Asp Ala Val Leu Ala Ile Ala Ala His
3985   3990   3995   4000

Phe Ala Gly Glu Gly Arg Lys Thr Thr Arg Leu Arg Val Ser His Ala
                4005   4010   4015

Phe His Ser Pro Leu Met Glu Pro Met Leu Glu Glu Phe Arg Ala Val
                4020   4025   4030

Val Thr Arg Leu Ser Phe Gly Thr Pro Thr Ile Pro Val Val Ser Asn
    4035   4040   4045

Leu Thr Gly Arg Leu Ala Glu Pro Glu Gln Leu Ala His Ala Asp Tyr
    4050   4055   4060

Trp Val Arg His Val Arg Glu Ala Val Arg Phe Ala Asp Gly Ile Gln
4065   4070   4075   4080

Ala Leu Arg Ala Glu Gly Val Thr Arg Phe Leu Glu Leu Gly Pro Asp
                4085   4090   4095

Gly Val Leu Ser Ala Met Ala Arg Glu Ser Ala Ser Asp Asp Ala Val
                4100   4105   4110

Leu Ala Pro Val Leu Arg Arg Asp Arg Pro Glu Glu Thr Ala Leu Leu
    4115   4120   4125

Gly Ala Leu Ala Gln Leu Tyr Val Arg Gly Ala His Val Asp Trp Thr
    4130   4135   4140

Val Pro Phe Ala Gly Ser Gly Ala Arg Trp Ala Asp Leu Pro Thr Tyr
4145   4150   4155   4160

Ala Phe Gln His Glu Arg Phe Trp Pro Ser Gly Gly Val Ala Arg Pro
                4165   4170   4175

Gly Asp Val Arg Ser Ala Gly Leu Gly Ser Ala Gly His Pro Leu Leu
                4180   4185   4190

Gly Ala Ala Val Glu Leu Ala Gly Ser Gly Gly Leu Leu Phe Thr Gly
                4195   4200   4205

Arg Leu Ser Val Ser Ser His Pro Trp Leu Ala Asp His Val Val Leu
    4210   4215   4220

Gly Ser Val Leu Val Pro Gly Thr Ala Leu Val Glu Leu Val Leu Arg
4225   4230   4235   4240

Ala Ala Asp Glu Ala Gly Cys Asp Leu Leu Glu Glu Leu Thr Leu Ala
                4245   4250   4255

Ala Pro Leu Val Leu Pro Ala Ser Gly Ala Ala Val Gln Val Gln Val
                4260   4265   4270

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Ala Val Gly Glu Pro Asp Glu Ala Gly Arg Arg Pro Val Ser Val His
    4275              4280              4285

Ala Arg Glu Gly Glu Gly Pro Trp Thr Leu His Ala Ser Gly Ala Val
    4290              4295              4300

Thr  Ser Gly Ala Glu Val Pro Pro Phe Asp Ala Thr Val Trp Pro Pro
4305              4310              4315              4320

Lys Gly Ala Glu Pro Val Asp Val Ala Asp Cys Tyr Asp Val Leu Ala
              4325              4330              4335

Asp Ala Gly Leu Thr Tyr Gly Pro Ala Phe His Gly Leu Gln Ala Ala
              4340              4345              4350

Trp Lys Leu Gly Gly Asp Val Tyr Ala Glu Ala Lys Leu Pro Glu Ser
    4355              4360              4365

Thr Asp Gly Asp Ala Tyr Gly Leu His Pro Ala Leu Phe Asp Ala Ala
    4370              4375              4380

Leu  His Ala Ser Ala Leu Gly Gly Ala Glu Ala Gly Gly Val Pro Phe
4385              4390              4395              4400

Ser Trp Ala Gly Val Ser Leu His Ala Thr Gly Ala Ser His Leu Arg
              4405              4410              4415

Val Arg Ile Arg Glu Ala Gly Gly Ala Leu Ser Val Ala Ile Ala Asp
    4420              4425              4430

Thr Ser Gly Ala Pro Val Ala Ser Val Glu Ser Leu Val Ile Arg Pro
    4435              4440              4445

Leu Ser Ala Gly Gln Val Gln Ala Ala Asp Arg Asp Ala Leu Phe Lys
    4450              4455              4460

Ala  Asp Trp Val Pro Val Pro Leu Thr Asp Glu Arg Val Glu Pro Gly
4465              4470              4475              4480

Thr Gly Pro Glu Gly Glu Pro Leu Arg Thr Tyr Ala Asp Leu Asp Ser
              4485              4490              4495

Leu Glu Gly Ala Ala Val Pro Gly Thr Val Leu Val Ala Pro Pro Ser
              4500              4505              4510

Gly Ala Ala Gly Thr Val Glu Ser Val His Ala Ala Thr Val Trp Ala
              4515              4520              4525

Leu Glu Met Val Gln Ala Trp Leu Ala Asp Asp Arg Phe Ala Thr Ser
    4530              4535              4540

Arg  Leu Val Phe Val Thr Arg Gly Ala Ala Phe Gly Ala Asp Leu Ala
4545              4550              4555              4560

Ala Ala Ala Val Arg Gly Leu Val Arg Ser Ala Gln Ser Glu Asn Pro
              4565              4570              4575
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60

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Gly Arg Phe Gly Leu Val Asp Met Asp Gly Asp Ala Asp Thr Thr Val
        4580                4585                4590

Pro Ala Gln Ala Leu Ala Thr Asp Glu Pro Glu Leu Leu Val Arg Gly
        4595                4600                4605

Gly Glu Val Leu Ala Ala Arg Leu Val Arg Ala Gln Ser Ser His Thr
    4610                4615                4620

Val  Thr Trp Asp Pro Ser Gly Thr Val Leu Ile Thr Gly Gly Thr Gly
4625                4630                4635                4640

Gly Leu Gly Arg Ser Val Ala Arg His Leu Val Ser Glu His Gly Val
        4645                4650                4655

Arg Ser Leu Leu Leu Val Ser Arg Arg Gly Pro Ala Ala Glu Gly Ala
        4660                4665                4670

Gly Glu Leu Val Ala Glu Leu Arg Gly Ser Gly Ala Glu Val Val Ile
    4675                4680                4685

Glu Ala Cys Asp Val Thr Asp Ala Val Ala Val Ala Asp Leu Val Ala
    4690                4695                4700

Arg  His Arg Ile Ser Ala Val Val His Thr Ala Gly Val Leu Asp Asp
4705                4710                4715                4720

Gly Val Val Glu Ser Leu Thr Pro Glu Arg Leu Ala Val Val Leu Arg
        4725                4730                4735

Pro Lys Val Asp Ala Ala Trp Asn Leu His Glu Ala Thr Arg Gly Leu
        4740                4745                4750

Asp Leu Asp Ala Phe Val Val Phe Ser Ser Val Ala Gly Thr Phe Gly
        4755                4760                4765

Ser Ala Gly Gln Ala Asn Tyr Ala Ala Gly Asn Ala Phe Leu Asp Ala
    4770                4775                4780

Leu  Ala Tyr His Arg Arg Ala Val Gly Leu Pro Ala Val Ser Leu Ala
4785                4790                4795                4800

Trp Gly Pro Trp Ser Gln Asp Gly Gly Met Thr Gly Thr Leu Ser Asp
        4805                4810                4815

Ala Asp Val Gln Arg Ile Ala Arg Gln Gly Met Pro Pro Leu Thr Val
        4820                4825                4830

Glu Glu Gly Leu Ala Leu Phe Asp Ala Ala Leu Gly Ser Ala Glu Pro
        4835                4840                4845

Met Ala Leu Pro Val Arg Leu Asp Leu Ala Ala Leu Arg Ala Gln Gly
        4850                4855                4860

Glu  Pro Gln Pro Leu Leu Arg Gly Leu Ile Arg Thr Arg Thr Arg Arg
4865                4870                4875                4880
```

61

Ser Gly Ala Ala Ala Ala Ser Gly Ile Ala Gln Arg Leu Ala Gly Leu
        4885   4890   4895

Ser Thr Ala Glu Arg Arg Glu Ala Leu Leu Asp Val Val Arg Ala Gln
        4900   4905   4910

Ile Ala Thr Val Leu Gly His Ala Gly Pro Glu Thr Ile Ala Pro Asp
        4915   4920   4925

Arg Ala Phe Gln Asp Leu Gly Leu Asp Ser Leu Thr Ala Ile Glu Leu
        4930   4935   4940

Arg Asn Leu Leu Gly Lys Ala Thr Gly Leu Arg Leu Pro Ala Thr Thr
4945   4950   4955   4960

Val Phe Asp Tyr Pro Thr Val Asp Ala Leu Ala Ala His Leu Leu Asp
        4965   4970   4975

Glu Leu Phe Gly Ala Glu Thr Gly Thr Ala Thr Glu Thr Pro Leu Pro
        4980   4985   4990

Val Pro Gly Leu Pro Ser Leu Ala Asp Asp Pro Val Val Ile Val Gly
        4995   5000   5005

Met Ser Cys Arg Phe Pro Gly Gly Val Ala Ser Pro Glu Asp Leu Trp
    5010   5015   5020

Arg Leu Val Ala Asp Gly Val Asp Ala Val Ser Ala Phe Pro Thr Asp
5025   5030   5035   5040

Arg Gly Trp Glu Ile Asp Asp Thr Tyr Asp Pro Glu Arg Glu Gly Ala
        5045   5050   5055

Ile Ala Thr Arg Ser Gly Gly Phe Leu His Asp Ala Ala Glu Phe Asp
        5060   5065   5070

Pro Glu Phe Phe Gly Met Ser Pro Arg Glu Ala Leu Thr Thr Asp Ala
        5075   5080   5085

Gln Gln Arg Leu Leu Leu Glu Thr Thr Trp Glu Ala Leu Glu Arg Ala
    5090   5095   5100

Gly Met Asp Pro Ala Thr Leu Arg Gly Ser Arg Thr Gly Val Phe Ala
5105   5110   5115   5120

Gly Val Met Tyr His Asp Tyr Ser Thr Leu Leu Ser Gly Arg Glu Phe
        5125   5130   5135

Glu Gly Tyr Gln Gly Ser Gly Ser Ala Gly Ser Val Ala Ser Gly Arg
        5140   5145   5150

Val Ser Tyr Thr Phe Gly Phe Glu Gly Pro Ala Val Thr Val Asp Thr
        5155   5160   5165

Ala Cys Ser Ser Ser Leu Val Ala Leu His Leu Ala Ala Gln Ser Leu
    5170   5175   5180

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Arg   Ser Gly Glu Cys Ser Leu Ala Leu Ala Gly Gly Val Thr Val Met
5185                5190                5195                5200

Ser Thr Pro Leu Thr Phe Val Glu Phe Ser Arg Gln Gly Gly Leu Ser
         5205                5210                5215

Ala Asp Gly Arg Cys Lys Ala Phe Ala Asp Ala Ala Asp Gly Val Gly
         5220                5225                5230

Trp Ala Glu Gly Ala Gly Ile Leu Val Leu Glu Arg Leu Ser Asp Ala
         5235                5240                5245

Arg Arg Asn Gly His Arg Ile Leu Ala Thr Val Arg Gly Ser Ala Val
         5250                5255                5260

Asn   Gln Asp Gly Ala Ser Asn Gly Leu Thr Ala Pro Asn Gly Pro Ala
5265                5270                5275                5280

Gln Gln Arg Val Ile Arg Gln Ala Leu Ala Ser Ala Gly Leu Ser Ala
         5285                5290                5295

Ala Asp Val Asp Ala Val Glu Ala His Gly Thr Gly Thr Thr Leu Gly
         5300                5305                5310

Asp Pro Ile Glu Ala Gln Ala Leu Leu Ala Thr Tyr Gly Gln Glu Arg
         5315                5320                5325

Pro Glu Asp Arg Pro Leu Leu Leu Gly Ser Val Lys Ser Asn Ile Gly
         5330                5335                5340

His   Ala Gln Ala Ala Ser Gly Val Ala Gly Val Ile Lys Met Val Leu
5345                5350                5355                5360

Ala Met Arg His Gly Val Leu Pro Arg Thr Leu His Val Asp Glu Pro
         5365                5370                5375

Ser Ser His Val Asp Trp Ser Ala Gly Ala Val Glu Leu Leu Thr Ser
         5380                5385                5390

Glu Ala Glu Trp Pro Gln Gly Glu Gly Pro Arg Arg Ala Gly Val Ser
         5395                5400                5405

Ser Phe Gly Ile Ser Gly Thr Asn Ala His Val Ile Leu Glu Gln Pro
         5410                5415                5420

Glu   Pro Val Ala Ala Glu Thr Glu Ser Ile Thr Pro Asp Thr Ala Pro
5425                5430                5435                5440

Asp Ala Ala Glu Asp Glu Ala Ala Asp Ser Gly Thr Pro Val Pro Ala
         5445                5450                5455

Leu Leu Ser Gly Arg Ser Ala Ser Ala Leu Arg Ala Gln Ala Ala Arg
         5460                5465                5470

Leu Leu Ser Arg Leu Asp Gly Asp Pro Gly Pro Arg Ile Thr Asp Val
         5475                5480                5485
```

63

Ala Tyr Ser Leu Ala Thr Gly Arg Ser Ala Phe Pro His Arg Ala Val
    5490   5495   5500

Ile Leu Ala Ala Asn Arg Ala Asp Leu Leu His Ser Leu Ser Ala Leu
5505   5510   5515   5520

Ala Glu Gly His Thr Glu Ala Pro Ala Val Val Ala Gln Asp Arg Ala
                5525   5530   5535

Arg Ser Gly Lys Leu Ala Phe Leu Phe Ser Gly Gln Gly Ser Gln Arg
                5540   5545   5550

Leu Gly Met Gly Arg Glu Leu Tyr Gly Arg Tyr Pro Ala Phe Ala Glu
        5555   5560   5565

Ala Leu Asp Ala Val Cys Ala Ala Leu Asp Ala His Leu Asp Arg Pro
    5570   5575   5580

Leu Arg Asp Val Ile Trp Gly Glu Asp Ala Glu Leu Leu Asn Arg Thr
5585   5590   5595   5600

Gly Tyr Ala Gln Thr Gly Leu Phe Ala Ile Glu Val Ala Leu Phe Arg
                5605   5610   5615

Leu Leu Glu Ser Trp Gly Val Arg Pro Asp His Leu Leu Gly His Ser
        5620   5625   5630

Ile Gly Glu Ile Ala Ala Ala His Val Ala Gly Val Leu Ser Leu Pro
        5635   5640   5645

Asp Ala Cys Ala Leu Val Ala Ala Arg Gly Arg Leu Met Gln Gln Leu
    5650   5655   5660

Pro Ser Gly Gly Ala Met Met Ala Ile Arg Ala Thr Glu Asp Glu Val
5665   5670   5675   5680

Leu Pro His Leu Ala Glu Gly Val Ser Leu Ala Ala Val Asn Gly Pro
            5685   5690   5695

Ser Ser Val Val Val Ser Gly Ala Glu Asp Glu Val Leu Ala Leu Ala
        5700   5705   5710

Ala His Phe Glu Glu Glu Gly Arg Lys Thr Thr Arg Leu Arg Val Ser
        5715   5720   5725

His Ala Phe His Ser Pro Leu Met Glu Pro Met Leu Ala Asp Phe Arg
    5730   5735   5740

Ala Val Ala Asp Gly Met Thr Tyr Ala Ala Pro Arg Ile Pro Val Val
5745   5750   5755   5760

Ser Asn Val Thr Gly Arg Pro Ala Thr Ala Glu Glu Leu Cys Cys Ala
            5765   5770   5775

Glu Tyr Trp Val Gly His Val Arg Glu Ala Val Arg Phe Ala Asp Gly
        5780   5785   5790

64

Val Gly Ala Leu Arg Glu Gln Gly Val Thr Thr Phe Leu Glu Leu Gly
        5795   5800   5805

Pro Asp Gly Ser Leu Ser Ala Leu Ala Ala Glu Ser Ala Ala Asp Asp
    5810   5815   5820

Ser Val Leu Ala Pro Val Leu Arg Lys Asn Arg Pro Glu Ala Pro Ala
5825   5830   5835   5840

Leu Leu Thr Ala Leu Ala Arg Leu His Ala Gln Gly Thr Pro Val Asp
            5845   5850   5855

Trp Ser Ala Ala Phe Ala Gly Thr Gly Ala Arg Trp Val Asp Leu Pro
        5860   5865   5870

Thr Tyr Ala Phe Gln His Glu Arg Phe Trp Pro Ser Gly Gly Ala Ala
        5875   5880   5885

Arg Ala Gly Asp Val Arg Ser Ala Gly Leu Gly Ser Ala Gly His Pro
    5890   5895   5900

Leu Leu Gly Ala Ala Val Glu Leu Ala Gly Ser Gly Gly Arg Leu Leu
5905   5910   5915   5920

Thr Gly Arg Leu Ser Leu Ser Ser His Pro Trp Leu Ala Asp His Val
            5925   5930   5935

Val Leu Gly Ser Val Leu Val Pro Gly Thr Ala Leu Met Glu Leu Val
            5940   5945   5950

Leu Arg Ala Ala Asp Glu Val Asp Cys Ala Ala Val Asp Glu Leu Thr
        5955   5960   5965

Leu Ala Ala Pro Leu Val Leu Pro Ala Ser Gly Ala Ala Ile Gln Val
    5970   5975   5980

Gln Val Trp Val Gly Glu Pro Asp Glu Ala Gly Arg Arg Pro Val Ser
5985   5990   5995   6000

Val His Ala Arg Glu Gly Glu Gly Pro Trp Thr Leu His Ala Asp Gly
            6005   6010   6015

Ala Leu Ala Pro Ala Ala Glu Thr Val Pro Phe Asp Thr Ala Ile Trp
        6020   6025   6030

Pro Pro Gln Gly Ala Glu His Leu Asp Ala Ala Gly Cys Tyr Glu Arg
        6035   6040   6045

Phe Ala Asp Ala Gly Phe Ala Tyr Gly Pro Val Phe Gln Gly Leu Arg
    6050   6055   6060

Ala Ala Trp Lys Leu Gly Glu Asp Ile Tyr Ala Glu Val Ala Leu Pro
6065   6070   6075   6080

Glu Gly Thr Asp Gly Asn Ala Tyr Gly Leu His Pro Ala Leu Phe Asp
            6085   6090   6095

Ala Ala Leu His Ala Ala Leu Leu Gly Gly Glu Gly Thr Asp Glu Ala
         6100   6105   6110

Ala Val Pro Phe Ser Trp Asn Gly Val Thr Leu His Ala Thr Gly Ala
         6115   6120   6125

Ser Arg Val Arg Val Arg Ile Arg Pro Thr Glu Gly Gly Thr Ser Ile
    6130   6135   .   6140

Ala Leu Val Asp Thr Ala Gly Ala Pro Val Ala Ser Val Arg Ser Leu
6145   6150   6155   6160

Thr Ala Arg Pro Ile Thr Ala Gly Gln Leu Gln Thr Gly Asp Arg Asp
         6165   6170   6175

Ser Leu Phe Gln Val Asp Trp Thr Thr Leu His Leu Thr Asp Glu Arg
         6180   6185   6190

Ala Asn Ser Leu Ala Leu Leu Gly Lys Asp Thr Glu Gly Ile Leu Asp
         6195   6200   6205

Thr Leu Ser Leu Gln Pro His Ala Asp Leu Asp Asp Leu Ala Ala Thr
    6210   6215   6220

Gly Val His Asp Thr Val Leu Ala Pro Leu Pro Thr Arg Thr Ala Gly
6225   6230   6235   6240

Thr Val Glu Ser Val His Ala Ala Thr Thr Gly Ala Leu Ala Leu Ile
         6245   6250   6255

Arg Ser Trp Leu Ala Asp Asp Arg Phe Ala Ala Ser Arg Leu Val Phe
         6260   6265   6270

Val Thr Arg Gly Ala Val Ser Gly Thr Asp Leu Ala Gly Ala Ser Val
         6275   6280   6285

Trp Gly Leu Val Arg Ser Ala Leu Leu Glu His Pro Gly Arg Phe Gly
    6290   6295   6300

Leu Val Asp Val Asp Val Asp Gln Asp Ala Glu Val Pro Leu Val Pro
6305   6310   6315   6320

Arg Ala Leu Ala Ser Asp Glu Pro Gln Val Leu Val Arg Gly Gly Glu
         6325   6330   6335

Val Leu Ala Ala Arg Leu Val Arg Ala Gln Ser Ser Asp Thr Val Thr
         6340   6345   6350

Trp Asp Pro Ser Gly Thr Val Leu Ile Thr Gly Gly Thr Gly Gly Leu
    6355   6360   6365

Gly Arg Ser Val Ala Arg His Leu Val Ser Glu His Gly Val Arg Ser
    6370   6375   6380

Leu Leu Leu Val Ser Arg Arg Gly Pro Ala Ala Glu Gly Val Asp Ala
6385   6390   6395   6400

66

Leu Val Ala Glu Leu Ala Glu Cys Gly Ala Gln Val Thr Val Glu Ala
          6405   6410   6415

Cys Asp Val Thr Asp Ala Val Ala Val Ala Asp Leu Val Ala Arg His
          6420   6425   6430

Arg Ile Ser Ala Val Val His Thr Ala Gly Val Leu Asp Asp Gly Val
          6435   6440   6445

Val Glu Ser Leu Thr Pro Glu Arg Leu Ser Ala Val Leu Arg Pro Lys
          6450   6455   6460

Val Asp Ala Ala Trp Asn Leu His Glu Ala Thr Arg Gly Leu Asp Leu
6465   6470   6475   6480

Asp Ala Phe Val Val Phe Ser Ser Val Ala Gly Thr Phe Gly Ser Ala
          6485   6490   6495

Gly Gln Ala Asn Tyr Ala Ala Gly Asn Ala Phe Leu Asp Ala Leu Ala
          6500   6505   6510

Tyr His Arg Arg Ala Val Gly Leu Pro Ala Val Ser Leu Ala Trp Gly
          6515   6520   6525

Pro Trp Ser Gln Asp Gly Gly Met Thr Gly Thr Leu Ser Asp Ala Asp
          6530   6535   6540

Val Gln Arg Ile Ala Arg Gln Gly Met Pro Pro Leu Thr Val Glu Glu
6545   6550   6555   6560

Gly Leu Ala Leu Phe Asp Ala Ala Leu Gly Ser Ala Glu Pro Met Ala
          6565   6570   6575

Leu Pro Val Arg Leu Asp Leu Ala Ala Leu Arg Ala Gln Gly Glu Pro
          6580   6585   6590

Gln Pro Leu Leu Arg Gly Leu Ile Arg Thr Pro Gly Arg Arg Thr Ala
          6595   6600   6605

Ala Ala Ala Thr Glu Gly Asp Thr Ala Ala Ala Phe Ala Gly Arg Leu
          6610   6615   6620

Thr Gly Leu Ser Ala Ala Glu Gly Arg Glu Val Val Leu Gly Ala Val
6625   6630   6635   6640

Arg Ser Gln Ile Ala Gly Val Leu Gly His Ala Glu Ala Thr Glu Ile
          6645   6650   6655

Asp Gln Asp Arg Ala Phe Leu Asp Leu Gly Phe Asp Ser Leu Thr Ala
          6660   6665   6670

Val Glu Leu Arg Asn Arg Leu Gly Ala Val Thr Gly Ile Arg Leu Pro
          6675   6680   6685

Ala Thr Leu Leu Phe Asp Tyr Pro Thr Pro Ala Glu Leu Val Ala His
          6690   6695   6700

67

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Leu   His Ala Arg Ile Ala Pro Glu Pro Thr Val Gly Pro Glu Ala Leu
6705              6710            6715              6720

Leu Gly Glu Leu Glu Arg Met Glu Lys Ser Phe Gly Gly Leu Asp Leu
            6725            6730            6735

Thr Glu Glu Met His Glu Gln Ile Ala Gly Arg Leu Glu Val Leu Arg
        6740            6745            6750

Ala Lys Trp Asp Ala Leu Arg Asp Thr Ala Ala Ala Ala Gly His Asp
        6755            6760            6765

Gly Ser Pro Ser Asp Glu Asp Phe Asp Phe Glu Ser Ala Ser Asp Asp
    6770            6775            6780

Glu   Val Phe Asp Leu Leu Asp Asn Glu Leu Gly Leu Ser
6785              6790            6795


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 1               5                  10                  15

gcc ctc ggc ggc gcc gca gcc gcc gga atg acc acg atc acc tcc gcc    96
Ala Leu Gly Gly Ala Ala Ala Ala Gly Met Thr Thr Ile Thr Ser Ala
            20                  25                  30

cct cat gcc gcg gcc gcc gac cgg cgc agt ccg cag gcc cgc agc ggc   144
Pro His Ala Ala Ala Ala Asp Arg Arg Ser Pro Gln Ala Arg Ser Gly
        35                  40                  45

tcg ttc gta ccg gcc gtg gtg atc ggt acg gga tac ggc gcc gcg gtc   192
Ser Phe Val Pro Ala Val Val Ile Gly Thr Gly Tyr Gly Ala Ala Val
    50                  55                  60

tcc gcg ctg cgg ctc ggc gag gcc gga att ccc acg ctc atg ctc gaa   240
Ser Ala Leu Arg Leu Gly Glu Ala Gly Ile Pro Thr Leu Met Leu Glu
 65                 70                  75                  80

atg ggc cag ctg tgg aac aag ccc gcc gac gac ggc aac gtc ttc tgc   288
Met Gly Gln Leu Trp Asn Lys Pro Ala Asp Asp Gly Asn Val Phe Cys
                85                  90                  95

gga atg ctc tcg ccc gac cgc cgc tcc agc tgg ttc aag tcc cgc acc   336
Gly Met Leu Ser Pro Asp Arg Arg Ser Ser Trp Phe Lys Ser Arg Thr
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68

gag gcc ccg ctc ggc tcg ttc ctg tgg ctg gat gtg atc aac cgc gac   384
Glu Ala Pro Leu Gly Ser Phe Leu Trp Leu Asp Val Ile Asn Arg Asp
        115   120   125

atc gac ccg tac gcg gga gtg ctg gac aag gtg cac ttc gac cag atg   432
Ile Asp Pro Tyr Ala Gly Val Leu Asp Lys Val His Phe Asp Gln Met
        130   135   140

tcg gtg tac gtg ggg cgg ggt gtc ggc ggc ggc tcg ctg gtc aac ggc   480
Ser Val Tyr Val Gly Arg Gly Val Gly Gly Gly Ser Leu Val Asn Gly
145   150   155   160

ggg atg gcc gtc gta ccg aag cgc tcg tac ttc gag gag gtc ctc ccg   528
Gly Met Ala Val Val Pro Lys Arg Ser Tyr Phe Glu Glu Val Leu Pro
                165   170   175

cgg gtg gac gcc gcc gag atg tac gac cgg tac ttc ccg cgc gcc aac   576
Arg Val Asp Ala Ala Glu Met Tyr Asp Arg Tyr Phe Pro Arg Ala Asn
            180   185   190

tcc atg ctc aag gtg aac cac atc gac aag ggg tgg ttc gag gag acg   624
Ser Met Leu Lys Val Asn His Ile Asp Lys Gly Trp Phe Glu Glu Thr
            195   200   205

gag tgg tac aag ttc gcg cgg gtc tcg cgc gag cag gcg ggc aag gcg   672
Glu Trp Tyr Lys Phe Ala Arg Val Ser Arg Glu Gln Ala Gly Lys Ala
        210   215   220

ggc ctg ggc acc acc ttc gtc ccc aac gtc tac gac ttc gac tac atg   720
Gly Leu Gly Thr Thr Phe Val Pro Asn Val Tyr Asp Phe Asp Tyr Met
225   230   235   240

cgg cgc gag gcg aac ggt gag tcg ccc aag tcc gcg ctg gcg acc gag   768
Arg Arg Glu Ala Asn Gly Glu Ser Pro Lys Ser Ala Leu Ala Thr Glu
            245   250   255

gtc atc tac ggc aac aac cac ggc aaa cag agc ctg gac aag acc tac   816
Val Ile Tyr Gly Asn Asn His Gly Lys Gln Ser Leu Asp Lys Thr Tyr
            260   265   270

ctg gcc gcc gcg ctc ggc acc ggc aag gtc acc atc gag acc ctg cac   864
Leu Ala Ala Ala Leu Gly Thr Gly Lys Val Thr Ile Glu Thr Leu His
        275   280   285

cag gtc agg gcg atc cac cag cag ccg gac ggc agc tac gtg ctg tcc   912
Gln Val Arg Ala Ile His Gln Gln Pro Asp Gly Ser Tyr Val Leu Ser
        290   295   300

gtg gac cag atc gac acg gcc ggc cag acc gtc gcc cac aag gag atc   960
Val Asp Gln Ile Asp Thr Ala Gly Gln Thr Val Ala His Lys Glu Ile
305   310   315   320

tcc tgc cgt cac ctg ttc ctc ggc gcc ggc agc ctc ggc tcc acc gaa   1008
Ser Cys Arg His Leu Phe Leu Gly Ala Gly Ser Leu Gly Ser Thr Glu
            325   330   335

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ctg ctg gtg cgc gcc cgg gac acc ggc gcg ctg ccc gac ctc aac gcc    1056
Leu Leu Val Arg Ala Arg Asp Thr Gly Ala Leu Pro Asp Leu Asn Ala
            340                 345                 350

gag gtc ggc gcg ggc tgg ggc ccc aac ggc aac atc atg acc ggc cgg    1104
Glu Val Gly Ala Gly Trp Gly Pro Asn Gly Asn Ile Met Thr Gly Arg
            355                 360                 365

gcc aac cac gtc tgg aac ccc acc ggg gcc cac cag tcc tcg atc ccc    1152
Ala Asn His Val Trp Asn Pro Thr Gly Ala His Gln Ser Ser Ile Pro
            370                 375                 380

gct ctg ggc atc gac gac tgg aac aac ccc acc gcc ccg gtc ttc gcc    1200
Ala Leu Gly Ile Asp Asp Trp Asn Asn Pro Thr Ala Pro Val Phe Ala
385                 390                 395                 400

gaa atc gcc ccg atg ccc gcc ggg ttg gag acc tgg gtc agc ctc tat    1248
Glu Ile Ala Pro Met Pro Ala Gly Leu Glu Thr Trp Val Ser Leu Tyr
                405                 410                 415

ctg gcg atc acc aag aac ccc gag cgc ggc acc ttc gtc tac gac aag    1296
Leu Ala Ile Thr Lys Asn Pro Glu Arg Gly Thr Phe Val Tyr Asp Lys
            420                 425                 430

gcc acc gac cgg gcc gcg ctg cgc tgg acg cgg gac cag aac acg ccc    1344
Ala Thr Asp Arg Ala Ala Leu Arg Trp Thr Arg Asp Gln Asn Thr Pro
            435                 440                 445

gcg gtc aac gcc gcc agg tcg ctc ttc gac cgc atc aac aag gcc aac    1392
Ala Val Asn Ala Ala Arg Ser Leu Phe Asp Arg Ile Asn Lys Ala Asn
            450                 455                 460

ggc acg atg tac cgc tac gac ctg ttc ggg ccg cag ctg aag aac ttc    1440
Gly Thr Met Tyr Arg Tyr Asp Leu Phe Gly Pro Gln Leu Lys Asn Phe
465                 470                 475                 480

tcc gac gac ttc tgc tac cac ccg ctc ggc ggc tgc gtc ctg ggc aag    1488
Ser Asp Asp Phe Cys Tyr His Pro Leu Gly Gly Cys Val Leu Gly Lys
                485                 490                 495

gcc acc gac ggg tac ggc cgg gtc gcc ggc tac cac aac ctc tac gtc    1536
Ala Thr Asp Gly Tyr Gly Arg Val Ala Gly Tyr His Asn Leu Tyr Val
                500                 505                 510

acg gac ggc gcg ctc atc ccg ggg tcc atc ggg gtc aac ccc ttc gtg    1584
Thr Asp Gly Ala Leu Ile Pro Gly Ser Ile Gly Val Asn Pro Phe Val
            515                 520                 525

acc atc acg gcg ctg gcc gag cgg aac atc gag cgg atc atc gcg gag    1632
Thr Ile Thr Ala Leu Ala Glu Arg Asn Ile Glu Arg Ile Ile Ala Glu
            530                 535                 540

gac gtc aag gcc gcc tag                                             1650
Asp Val Lys Ala Ala
545
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70

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  1   5   10   15

Ala Leu Gly Gly Ala Ala Ala Ala Gly Met Thr Thr Ile Thr Ser Ala
             20   25   30

Pro His Ala Ala Ala Ala Asp Arg Arg Ser Pro Gln Ala Arg Ser Gly
         35   40   45

Ser Phe Val Pro Ala Val Val Ile Gly Thr Gly Tyr Gly Ala Ala Val
     50   55   60

Ser Ala Leu Arg Leu Gly Glu Ala Gly Ile Pro Thr Leu Met Leu Glu
 65   70   75   80

Met Gly Gln Leu Trp Asn Lys Pro Ala Asp Asp Gly Asn Val Phe Cys
                 85   90   95

Gly Met Leu Ser Pro Asp Arg Arg Ser Ser Trp Phe Lys Ser Arg Thr
             100   105   110

Glu Ala Pro Leu Gly Ser Phe Leu Trp Leu Asp Val Ile Asn Arg Asp
         115   120   125

Ile Asp Pro Tyr Ala Gly Val Leu Asp Lys Val His Phe Asp Gln Met
     130   135   140

Ser Val Tyr Val Gly Arg Gly Val Gly Gly Ser Leu Val Asn Gly
145   150   155   160

Gly Met Ala Val Val Pro Lys Arg Ser Tyr Phe Glu Glu Val Leu Pro
             165   170   175

Arg Val Asp Ala Ala Glu Met Tyr Asp Arg Tyr Phe Pro Arg Ala Asn
         180   185   190

Ser Met Leu Lys Val Asn His Ile Asp Lys Gly Trp Phe Glu Glu Thr
         195   200   205

Glu Trp Tyr Lys Phe Ala Arg Val Ser Arg Glu Gln Ala Gly Lys Ala
     210   215   220

Gly Leu Gly Thr Thr Phe Val Pro Asn Val Tyr Asp Phe Asp Tyr Met
225   230   235   240

Arg Arg Glu Ala Asn Gly Glu Ser Pro Lys Ser Ala Leu Ala Thr Glu
             245   250   255

Val Ile Tyr Gly Asn Asn His Gly Lys Gln Ser Leu Asp Lys Thr Tyr
         260   265   270

71

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Leu Ala Ala Ala Leu Gly Thr Gly Lys Val Thr Ile Glu Thr Leu His
    275                 280                 285

Gln Val Arg Ala Ile His Gln Gln Pro Asp Gly Ser Tyr Val Leu Ser
    290                 295                 300

Val Asp Gln Ile Asp Thr Ala Gly Gln Thr Val Ala His Lys Glu Ile
305                 310                 315                 320

Ser Cys Arg His Leu Phe Leu Gly Ala Gly Ser Leu Gly Ser Thr Glu
                325                 330                 335

Leu Leu Val Arg Ala Arg Asp Thr Gly Ala Leu Pro Asp Leu Asn Ala
                340                 345                 350

Glu Val Gly Ala Gly Trp Gly Pro Asn Gly Asn Ile Met Thr Gly Arg
                355                 360                 365

Ala Asn His Val Trp Asn Pro Thr Gly Ala His Gln Ser Ser Ile Pro
    370                 375                 380

Ala Leu Gly Ile Asp Asp Trp Asn Asn Pro Thr Ala Pro Val Phe Ala
385                 390                 395                 400

Glu Ile Ala Pro Met Pro Ala Gly Leu Glu Thr Trp Val Ser Leu Tyr
                405                 410                 415

Leu Ala Ile Thr Lys Asn Pro Glu Arg Gly Thr Phe Val Tyr Asp Lys
                420                 425                 430

Ala Thr Asp Arg Ala Ala Leu Arg Trp Thr Arg Asp Gln Asn Thr Pro
                435                 440                 445

Ala Val Asn Ala Ala Arg Ser Leu Phe Asp Arg Ile Asn Lys Ala Asn
    450                 455                 460

Gly Thr Met Tyr Arg Tyr Asp Leu Phe Gly Pro Gln Leu Lys Asn Phe
465                 470                 475                 480

Ser Asp Asp Phe Cys Tyr His Pro Leu Gly Gly Cys Val Leu Gly Lys
                485                 490                 495

Ala Thr Asp Gly Tyr Gly Arg Val Ala Gly Tyr His Asn Leu Tyr Val
                500                 505                 510

Thr Asp Gly Ala Leu Ile Pro Gly Ser Ile Gly Val Asn Pro Phe Val
                515                 520                 525

Thr Ile Thr Ala Leu Ala Glu Arg Asn Ile Glu Arg Ile Ile Ala Glu
    530                 535                 540

Asp Val Lys Ala Ala
545


<210> 7
```

72

<211> 1197
<212> DNA
<213> Streptomyces natalensis

<220>
<221> CDS
<222> (1)..(1197)
<223> ORF2

<400> 7
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atg acg tac aca gac ccg gcc gcg ccc gag acg gat ccg ccg gcc gtc      48
Met Thr Tyr Thr Asp Pro Ala Ala Pro Glu Thr Asp Pro Pro Ala Val
 1               5                  10                  15

gac ttt ccg cag cgc aag ccc ggc gtg ccg ttc ccg ccg ccc gac tac      96
Asp Phe Pro Gln Arg Lys Pro Gly Val Pro Phe Pro Pro Pro Asp Tyr
                20                  25                  30

gcc gac tac cgc gac cgg aag ggg ctc gtc ctc tcg cag ctg tcc gac     144
Ala Asp Tyr Arg Asp Arg Lys Gly Leu Val Leu Ser Gln Leu Ser Asp
            35                  40                  45

ggc aaa cgg gta tgg ctg gtc acc cgg cac gag gac gta cgc gcc gta     192
Gly Lys Arg Val Trp Leu Val Thr Arg His Glu Asp Val Arg Ala Val
        50                  55                  60

ctg acc agc ccg agc atc agc tcg aac ccc gag cac aag gga ttt ccc     240
Leu Thr Ser Pro Ser Ile Ser Ser Asn Pro Glu His Lys Gly Phe Pro
 65                  70                  75                  80

aac gtc ggg aac ctg ggt gtg ccc aag cag gac cag atc ccg ggc tgg     288
Asn Val Gly Asn Leu Gly Val Pro Lys Gln Asp Gln Ile Pro Gly Trp
                85                  90                  95

ttc gtg ggc atg gac tcc ccc gag cac gac cgg ttc cgc aag gcc ctc     336
Phe Val Gly Met Asp Ser Pro Glu His Asp Arg Phe Arg Lys Ala Leu
                100                 105                 110

atc ccg gag ttc acc gtc cgg cgg gta cgc gcg atg aag ccc gcg atc     384
Ile Pro Glu Phe Thr Val Arg Arg Val Arg Ala Met Lys Pro Ala Ile
            115                 120                 125

gaa cgc acg gtg gac gcc caa ctg gac gcc atg ctg gcc gcg ggc aac     432
Glu Arg Thr Val Asp Ala Gln Leu Asp Ala Met Leu Ala Ala Gly Asn
        130                 135                 140

acc gcc gac ctc gtc gcc gac ttc gcc ctg ccc atc ccc tcc ctg gtg     480
Thr Ala Asp Leu Val Ala Asp Phe Ala Leu Pro Ile Pro Ser Leu Val
145                 150                 155                 160

atc tcc gca ctg ctc ggc gtg ccg ccc gcc gac cgc gag ttc ttc gag     528
Ile Ser Ala Leu Leu Gly Val Pro Pro Ala Asp Arg Glu Phe Phe Glu
                165                 170                 175

tcc agg acc cgc gtc ctg gtc tcc ctc cgc tcc tcc acc gac gac gac     576
Ser Arg Thr Arg Val Leu Val Ser Leu Arg Ser Ser Thr Asp Asp Asp
                180                 185                 190
```

73

```
cgg atg gcc gcc gcc aag gac ctc ctg cgg tac atc aac cgg ctc gtg    624
Arg Met Ala Ala Ala Lys Asp Leu Leu Arg Tyr Ile Asn Arg Leu Val
        195                 200                 205

gag atc aaa cag aag tgg ggc ggc gac gac ctc atc acc cgg ctg ctg    672
Glu Ile Lys Gln Lys Trp Gly Gly Asp Asp Leu Ile Thr Arg Leu Leu
    210                 215                 220

gcc acc ggt gcc atc gcc ccc cac gaa atg tcc ggc gtg ctg atg ctc    720
Ala Thr Gly Ala Ile Ala Pro His Glu Met Ser Gly Val Leu Met Leu
225                 230                 235                 240

ctg ctc atc gcc ggc cac gag acc acg gcc aac aac atc gcc ctc ggc    768
Leu Leu Ile Ala Gly His Glu Thr Thr Ala Asn Asn Ile Ala Leu Gly
                245                 250                 255

gtg gtc acc ctg ctg gcg aac ccc caa tgg atc ggc gac gac cgg gcc    816
Val Val Thr Leu Leu Ala Asn Pro Gln Trp Ile Gly Asp Asp Arg Ala
                260                 265                 270

gtg gag gag acc ctg cgc ttc cac tcc gtc gcc gac ctg gtg tcc ctg    864
Val Glu Glu Thr Leu Arg Phe His Ser Val Ala Asp Leu Val Ser Leu
            275                 280                 285

cgc gtc gcg gtc cag gac gtg gaa atc gcc ggg cag ctc atc aag gcg    912
Arg Val Ala Val Gln Asp Val Glu Ile Ala Gly Gln Leu Ile Lys Ala
        290                 295                 300

ggc gag gga atc gtg ccg ctg gtc gcc gcc gcc aat cat gac gag aac    960
Gly Glu Gly Ile Val Pro Leu Val Ala Ala Ala Asn His Asp Glu Asn
305                 310                 315                 320

gcc ttc gaa tgc ccc cac gcc ttc gac ccg tcc cgg tcc gcc cgc cac   1008
Ala Phe Glu Cys Pro His Ala Phe Asp Pro Ser Arg Ser Ala Arg His
                325                 330                 335

cat gtg gcc ttc ggc tac ggc gta cac caa tgc ctg gga cag aac ctg   1056
His Val Ala Phe Gly Tyr Gly Val His Gln Cys Leu Gly Gln Asn Leu
                340                 345                 350

gtg cgg atc gag atg gaa gtc gcg tac cgg aaa ctc ttc gag cgc atc   1104
Val Arg Ile Glu Met Glu Val Ala Tyr Arg Lys Leu Phe Glu Arg Ile
        355                 360                 365

ccg aac ctc gaa ctc gcc gtg ccc acc gac ggg ttg gac atc aag tac   1152
Pro Asn Leu Glu Leu Ala Val Pro Thr Asp Gly Leu Asp Ile Lys Tyr
        370                 375                 380

gac ggc gtg ctc tac ggc ctg aac gag ctg ccc gtc cgc tgg tag       1197
Asp Gly Val Leu Tyr Gly Leu Asn Glu Leu Pro Val Arg Trp
385                 390                 395


<210> 8
<211> 398
<212> PRT
```

74

<213> Streptomyces natalensis

<400> 8
Met Thr Tyr Thr Asp Pro Ala Ala Pro Glu Thr Asp Pro Pro Ala Val
 1   5   10   15

Asp Phe Pro Gln Arg Lys Pro Gly Val Pro Phe Pro Pro Pro Asp Tyr
            20   25   30

Ala Asp Tyr Arg Asp Arg Lys Gly Leu Val Leu Ser Gln Leu Ser Asp
            35   40   45

Gly Lys Arg Val Trp Leu Val Thr Arg His Glu Asp Val Arg Ala Val
    50   55   60

Leu Thr Ser Pro Ser Ile Ser Ser Asn Pro Glu His Lys Gly Phe Pro
65   70   75   80

Asn Val Gly Asn Leu Gly Val Pro Lys Gln Asp Gln Ile Pro Gly Trp
                85   90   95

Phe Val Gly Met Asp Ser Pro Glu His Asp Arg Phe Arg Lys Ala Leu
            100   105   110

Ile Pro Glu Phe Thr Val Arg Arg Val Arg Ala Met Lys Pro Ala Ile
        115   120   125

Glu Arg Thr Val Asp Ala Gln Leu Asp Ala Met Leu Ala Ala Gly Asn
    130   135   140

Thr Ala Asp Leu Val Ala Asp Phe Ala Leu Pro Ile Pro Ser Leu Val
145   150   155   160

Ile Ser Ala Leu Leu Gly Val Pro Pro Ala Asp Arg Glu Phe Phe Glu
                165   170   175

Ser Arg Thr Arg Val Leu Val Ser Leu Arg Ser Ser Thr Asp Asp Asp
        180   185   190

Arg Met Ala Ala Ala Lys Asp Leu Leu Arg Tyr Ile Asn Arg Leu Val
        195   200   205

Glu Ile Lys Gln Lys Trp Gly Gly Asp Asp Leu Ile Thr Arg Leu Leu
    210   215   220

Ala Thr Gly Ala Ile Ala Pro His Glu Met Ser Gly Val Leu Met Leu
225   230   235   240

Leu Leu Ile Ala Gly His Glu Thr Thr Ala Asn Asn Ile Ala Leu Gly
                245   250   255

Val Val Thr Leu Leu Ala Asn Pro Gln Trp Ile Gly Asp Asp Arg Ala
            260   265   270

Val Glu Glu Thr Leu Arg Phe His Ser Val Ala Asp Leu Val Ser Leu
            275   280   285

75

```
Arg Val Ala Val Gln Asp Val Glu Ile Ala Gly Gln Leu Ile Lys Ala
    290             295             300

Gly Glu Gly Ile Val Pro Leu Val Ala Ala Ala Asn His Asp Glu Asn
305             310             315             320

Ala Phe Glu Cys Pro His Ala Phe Asp Pro Ser Arg Ser Ala Arg His
            325             330             335

His Val Ala Phe Gly Tyr Gly Val His Gln Cys Leu Gly Gln Asn Leu
            340             345             350

Val Arg Ile Glu Met Glu Val Ala Tyr Arg Lys Leu Phe Glu Arg Ile
        355             360             365

Pro Asn Leu Glu Leu Ala Val Pro Thr Asp Gly Leu Asp Ile Lys Tyr
    370             375             380

Asp Gly Val Leu Tyr Gly Leu Asn Glu Leu Pro Val Arg Trp
385             390             395
```

<210> 9
<211> 1194
<212> DNA
<213> Streptomyces natalensis

<220>
<221> CDS
<222> (1)..(1194)
<223> ORF3

<400> 9
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atg acc gcc gcc tcc cac gac ctg ccc tgc ctc aac ctc gaa ccg ccc    48
Met Thr Ala Ala Ser His Asp Leu Pro Cys Leu Asn Leu Glu Pro Pro
  1               5                  10                  15

aaa atg ctg aaa ctg agc ccg ctg ctg cgc gcc ttg cag gac cgg ggg    96
Lys Met Leu Lys Leu Ser Pro Leu Leu Arg Ala Leu Gln Asp Arg Gly
                20                  25                  30

ccg atc cac cgg gtg cgc aca ccc gcc ggg gac gag gcg tgg ctg gtg   144
Pro Ile His Arg Val Arg Thr Pro Ala Gly Asp Glu Ala Trp Leu Val
            35                  40                  45

acc cgc cac gcc gag ctc aag cag ctg ctg cac gac gag cgc atc ggc   192
Thr Arg His Ala Glu Leu Lys Gln Leu Leu His Asp Glu Arg Ile Gly
        50                  55                  60

cgc acg cac ccc gac ccg ccc tcc gcc gcc cag tac gta cgc agc ccc   240
Arg Thr His Pro Asp Pro Pro Ser Ala Ala Gln Tyr Val Arg Ser Pro
 65                  70                  75                  80

ttc ctg gac ctg ctg atc agc gac gcc gac gcc gag tcc ggg cgt cgg   288
Phe Leu Asp Leu Leu Ile Ser Asp Ala Asp Ala Glu Ser Gly Arg Arg
                85                  90                  95
```

76

```
cag cac gcc gag acc cgc cgc ctg ctc act ccg ttg ttc tcg gcc cgg      336
Gln His Ala Glu Thr Arg Arg Leu Leu Thr Pro Leu Phe Ser Ala Arg
            100                 105                 110

cgc gtt ctg gaa atg cag ccg aag gtg gag gag gcc gcg gac acc ctg      384
Arg Val Leu Glu Met Gln Pro Lys Val Glu Glu Ala Ala Asp Thr Leu
            115                 120                 125

ctg gac gcg ttc atc gcc cag ggg cct ccc ggc gac ctg cac ggc gag      432
Leu Asp Ala Phe Ile Ala Gln Gly Pro Pro Gly Asp Leu His Gly Glu
            130                 135                 140

ctc acc gtg ccg ttc gcc ctc acg gtc ctc tgc gag gtc atc ggc gtg      480
Leu Thr Val Pro Phe Ala Leu Thr Val Leu Cys Glu Val Ile Gly Val
145                 150                 155                 160

ccg ccg cag cgc cgc gcg gag ctg acc aca ctg ctg gcc ggt atc gcc      528
Pro Pro Gln Arg Arg Ala Glu Leu Thr Thr Leu Leu Ala Gly Ile Ala
                165                 170                 175

aag ctg gac gac cgc gag ggc gcc gta cgg gca cag gac gac ctg ttc      576
Lys Leu Asp Asp Arg Glu Gly Ala Val Arg Ala Gln Asp Asp Leu Phe
            180                 185                 190

ggg tac gtg gca ggg ctg gtc gag cac aag cgg gcc gag ccc ggc cca      624
Gly Tyr Val Ala Gly Leu Val Glu His Lys Arg Ala Glu Pro Gly Pro
            195                 200                 205

gac atc atc tcc cgg ctg aac gac ggc gag ctg acc gag gac cgc gtg      672
Asp Ile Ile Ser Arg Leu Asn Asp Gly Glu Leu Thr Glu Asp Arg Val
            210                 215                 220

gca cac ctg gcc atg ggc ctg ctg ttc gcc ggg ctg gac agc gtc gcg      720
Ala His Leu Ala Met Gly Leu Leu Phe Ala Gly Leu Asp Ser Val Ala
225                 230                 235                 240

agc atc atg gac aac ggg gtg gtg ctg ctg gcc gcc cac ccc gat cag      768
Ser Ile Met Asp Asn Gly Val Val Leu Leu Ala Ala His Pro Asp Gln
                245                 250                 255

cgc gcg gcg gcg ctg gcc gac ccc gac gtg atg gcg cgt gcc gtg gag      816
Arg Ala Ala Ala Leu Ala Asp Pro Asp Val Met Ala Arg Ala Val Glu
            260                 265                 270

gag gtg ctg cgg acc gcc cgg gcc ggc ggg tcg gtc ctg ccg ccg cgc      864
Glu Val Leu Arg Thr Ala Arg Ala Gly Gly Ser Val Leu Pro Pro Arg
            275                 280                 285

tac gcc agc gag gac atg gaa ttc ggc ggg gtg acg ata cgg gcc gga      912
Tyr Ala Ser Glu Asp Met Glu Phe Gly Gly Val Thr Ile Arg Ala Gly
            290                 295                 300

gac ctg gtc ctg ttc gac ctc ggc ctg ccc aac ttc gac gag cgg gcg      960
Asp Leu Val Leu Phe Asp Leu Gly Leu Pro Asn Phe Asp Glu Arg Ala
305                 310                 315                 320

ttc aca ggg ccg gag gaa ttc gac gcc gcc agg acc ccc aat ccc cat     1008
```

77

```
Phe Thr Gly Pro Glu Glu Phe Asp Ala Ala Arg Thr Pro Asn Pro His
            325                 330                 335

ctg acc ttc ggc cac ggc atc tgg cac tgc atc ggc gcc ccc ctc gcg      1056
Leu Thr Phe Gly His Gly Ile Trp His Cys Ile Gly Ala Pro Leu Ala
            340                 345                 350

cgc ctg gaa ctc agg acg atg ttc acc aag ctg ttc acc cgc ctg ccg      1104
Arg Leu Glu Leu Arg Thr Met Phe Thr Lys Leu Phe Thr Arg Leu Pro
            355                 360                 365

gaa ctg cgc ccg gaa ctt ccg gtg gag caa ctg cgc ctg aag gag ggc      1152
Glu Leu Arg Pro Glu Leu Pro Val Glu Gln Leu Arg Leu Lys Glu Gly
        370                 375                 380

cag ctg tcg ggc ggc ttc gcc gag ctc cgg gtg gtc tgg tag              1194
Gln Leu Ser Gly Gly Phe Ala Glu Leu Arg Val Val Trp
385                 390                 395
```

<210> 10
<211> 397
<212> PRT
<213> Streptomyces natalensis

<400> 10
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Met Thr Ala Ala Ser His Asp Leu Pro Cys Leu Asn Leu Glu Pro Pro
 1               5                  10                  15

Lys Met Leu Lys Leu Ser Pro Leu Leu Arg Ala Leu Gln Asp Arg Gly
            20                  25                  30

Pro Ile His Arg Val Arg Thr Pro Ala Gly Asp Glu Ala Trp Leu Val
            35                  40                  45

Thr Arg His Ala Glu Leu Lys Gln Leu Leu His Asp Glu Arg Ile Gly
     50                  55                  60

Arg Thr His Pro Asp Pro Pro Ser Ala Ala Gln Tyr Val Arg Ser Pro
 65                  70                  75                  80

Phe Leu Asp Leu Leu Ile Ser Asp Ala Asp Ala Glu Ser Gly Arg Arg
                85                  90                  95

Gln His Ala Glu Thr Arg Arg Leu Leu Thr Pro Leu Phe Ser Ala Arg
                100                 105                 110

Arg Val Leu Glu Met Gln Pro Lys Val Glu Glu Ala Ala Asp Thr Leu
            115                 120                 125

Leu Asp Ala Phe Ile Ala Gln Gly Pro Pro Gly Asp Leu His Gly Glu
        130                 135                 140

Leu Thr Val Pro Phe Ala Leu Thr Val Leu Cys Glu Val Ile Gly Val
145                 150                 155                 160

Pro Pro Gln Arg Arg Ala Glu Leu Thr Thr Leu Leu Ala Gly Ile Ala
```

78

Lys Leu Asp Asp Arg Glu Gly Ala Val Arg Ala Gln Asp Asp Leu Phe
            180   185   190

Gly Tyr Val Ala Gly Leu Val Glu His Lys Arg Ala Glu Pro Gly Pro
            195   200   205

Asp Ile Ile Ser Arg Leu Asn Asp Gly Glu Leu Thr Glu Asp Arg Val
    210   215   220

Ala His Leu Ala Met Gly Leu Leu Phe Ala Gly Leu Asp Ser Val Ala
225   230   235   240

Ser Ile Met Asp Asn Gly Val Val Leu Leu Ala Ala His Pro Asp Gln
            245   250   255

Arg Ala Ala Ala Leu Ala Asp Pro Asp Val Met Ala Arg Ala Val Glu
            260   265   270

Glu Val Leu Arg Thr Ala Arg Ala Gly Gly Ser Val Leu Pro Pro Arg
            275   280   285

Tyr Ala Ser Glu Asp Met Glu Phe Gly Gly Val Thr Ile Arg Ala Gly
    290   295   300

Asp Leu Val Leu Phe Asp Leu Gly Leu Pro Asn Phe Asp Glu Arg Ala
305   310   315   320

Phe Thr Gly Pro Glu Glu Phe Asp Ala Ala Arg Thr Pro Asn Pro His
            325   330   335

Leu Thr Phe Gly His Gly Ile Trp His Cys Ile Gly Ala Pro Leu Ala
            340   345   350

Arg Leu Glu Leu Arg Thr Met Phe Thr Lys Leu Phe Thr Arg Leu Pro
            355   360   365

Glu Leu Arg Pro Glu Leu Pro Val Glu Gln Leu Arg Leu Lys Glu Gly
    370   375   380

Gln Leu Ser Gly Gly Phe Ala Glu Leu Arg Val Val Trp
385   390   395

<210> 11
<211> 40
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Forward primer
     ermE promoter

<400> 11
aaactgcagc tctagaggcg gcttgcgccc gatgctagtc   40

79

```
<210> 12
<211> 70
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Reverse primer
      ermE promoter

<400> 12
aaactgcagc tctagatggc ccgggtatcg atcgtcgacg gcatgcggat cctaccaacc 60

ggcacgattg                                                          70


<210> 13
<211> 30
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Forward primer ORF1

<400> 13
aggattaccc atatgttcga gaaccagcat                                    30


<210> 14
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Reverse primer ORF1

<400> 14
gcatgagcgt gggaattccg                                               20
```